AMERICAN MACHINIST

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Overhead Heating Arrangements of W. F. and John Barnes, Rockford, Ill.

For the following description we are indebted to the company above named:

"In regard to the cost of heating, and the amount of space heated, would say that we kept a record for one year, during which time we heated 400,000 cubic feet of space (our building being then not entirely completed).

"We use the same boiler for heating that we do for generating steam for our engine that drives the machinery. Parties acquainted with factories and the power required to drive machinery can form a very correct idea of the relative expense of heating buildings and driving machinery.

"The size of the boiler we use is 16 ft. long and 54 inches in diameter. It has 50 3-inch tubes, ordinary steam dome and mud drum. We use the common grate.

"Our chimney extends 100 ft. above the foundation. It is built double, having inside and outside shell independent of each other, with four-inch air space.

"We use a Straight Line engine, 10x14 cylinder, 225 revolutions per minute.

"The 400,000 cubic feet of space was heated during the year, whenever it was necessary. A large part of the time the exhaust from the engine through the pipes was all that was necessary for heating. During the coldest weather live steam from the boiler was turned on from time to time, as found necessary. The pipes are arranged so that either or both can be used at the same time, *i. e.*, live or exhaust steam.

"The water from the condensed steam is trapped back into a hot well, thus saving a large part of the heat. It is then pumped from this hot well through a Berryman heater into the boiler at a temperature of about 212 degrees, which plainly shows the saving of much heat.

"Each floor has a separate supply pipe and drip pipes. The latter combination is located at a point on the first floor where the engineer can at any time take off or throw on for any or all of the floors.

"The first impression one receives from this plan of heating is, that the top of the room will be warmer than the bottom, and that this will be so to such an extent as to make it uncomfortable for the workmen, heating their heads while their feet are cold. This is not true.

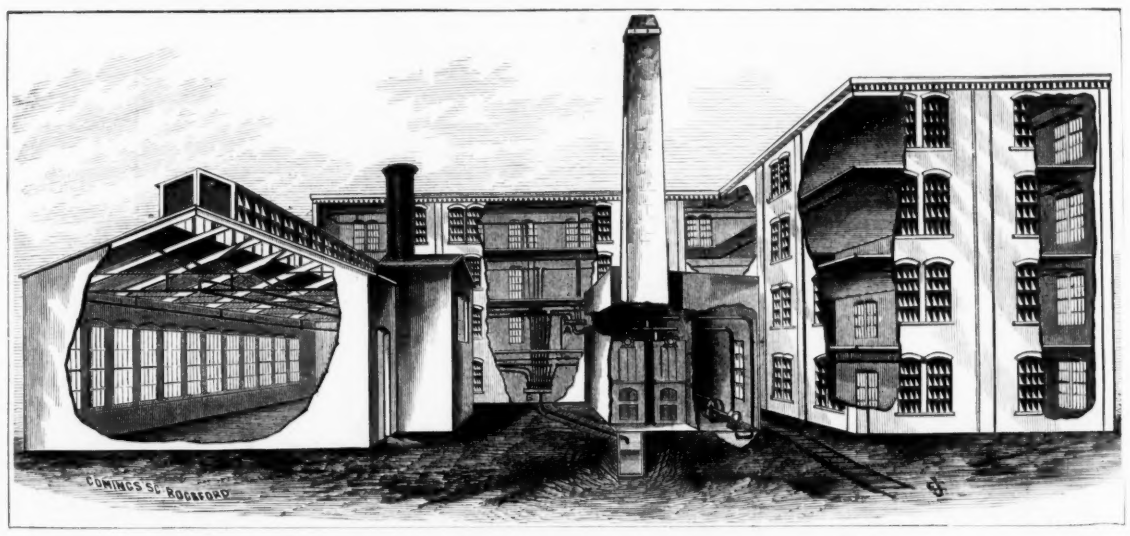
"We have no complaint whatever from our workmen, and we are satisfied that there is no arrangement of pipes that will give a more economical distribution of steam for heating purposes.

"At the time this report was made we had run this apparatus one year, heating the space referred to. For this heating we used an average of one ton of coal per day, which cost us on car beside our engine room an average of $1.50 per ton. This coal is that known as Illinois 'screenings, or slack coal.'

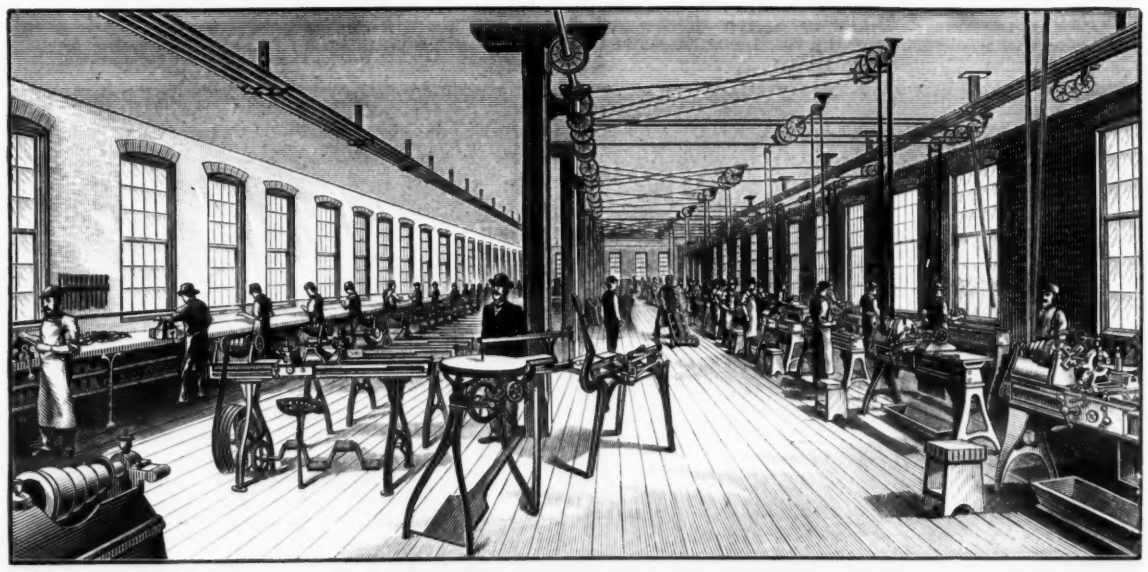
"Besides heating as above described, steam was supplied to the engine which drives machinery as follows: 500 ft. line shafting, from which were driven 40 iron lathes, 5 iron planers, 6 iron shapers, 12 drills, 2 milling machines, and several machines for special work, besides a complete set of wood-working machinery, including surface planer, band saws, circular saws, cut-off and rip saws, etc.

"We have just completed an additional building that will add to the above amount of space about 150,000 cubic feet. We see no reason why there should not be same economy in heating a greater space than we have given. The additional space will be mainly in a foundry building, the pipes in which will be placed overhead at least 16 ft. above the floor."

The foregoing with the illustrations, gives a fair idea of heating by overhead pipes. The opinion seems to be almost universal amongst those who have tried the overhead system that it costs no more to heat by steam in this way than in any other way, while it greatly economizes room.



VIEW OF MACHINE SHOP SHOWING ARRANGEMENT FOR OVERHEAD HEATING.



FLOOR OF W. F. & JOHN BARNES' MACHINE SHOP.

New York Master Car Builders' Club.

On the evening of November 20 this club held the first meeting of the season at the rooms on Liberty Street, New York. The fascinating theme of car couplers was the subject under consideration, and the evening was spent in examining models of patent inventions submitted by the patentees or their agents. Most of the car couplers exhibited are well-known inventions, and the greater part of them would satisfactorily perform the functions of an automatic car-coupler. Spending a whole evening in the inspection of these devices seems like rethreshing threshed straw. What the country and railroad companies particularly need in this car-coupling question is, that master car builders would come to some conclusion about what form of coupler is best for the needs of freight train service. All the good couplers cannot be chosen, so some inventors must be disappointed, and it would be a humane act for the master car builders of the country to do something towards ending the present suspense of the inventors destined to disappointment.

Egotism of Inventors.

The egotism of inventors of car couplers respecting the merits of their own devices is almost proverbial. Many visitors to exhibitions where car couplers were displayed have, with good reason, remarked the tendency of rival inventors to depreciate the value of their neighbor's invention. We have observed exhibitions of this senseless spirit on several occasions, but we never saw it so conspicuously displayed as in a case at the last meeting of the New York Master Car Builders' Club. An inventor at that meeting, who exhibited a very ordinary automatic car coupler, spent the greater part of the evening moving from place to place talking to those present about the ridiculous features of rival couplings. The greater part of his inuendoes and sneers applied as much to his own invention as they did to those of others.

"O wad some power the giftie gie us,
To see oursels as ithers see us."

Lubricating Oils.

An experienced dealer in oil writes us as follows:

"I have been for the past twelve years engaged in selling lubricating oils, and my experience for ten years of that time has been that the only object of consumers seems to have been 'How cheap can I get them?' without regarding the fact that quality should have something to do with it, and refusing to notice that, while they save in the price of oils, they lose ten times as much by reason of damage to machinery through the use of cheap oils. They also force first-class goods out of the market, and upright, honorable men out of business, simply because, if they cannot sell goods at a fair profit, they had rather close up their business. Such dealers will not resort to the tricks that are necessary to meet the demand of cheap trade, and consequently it has forced to the front men not of good personal character, and firms of no commercial standing. If consumers will notice the few following remarks humbly suggested by the writer, he thinks they cannot go far wrong:

"Nature has strongly designed that various things all have their uses, and all efforts to change this will surely meet with defeat. This is the case with lubricants; they all have their particular uses. For instance, cylinder oil needs to have a very heavy, dense body and high fire test, so as to resist the action of the steam. Heavy, coarse machinery needs thick, dense oil; lighter machinery still lighter oil, and so on all through the various uses for which oil is needed. The cheapest articles are generally found to be the dearest in the end, and it

will always pay to look at the end of an oil barrel as well as at the beginning. Consumers should not allow themselves to be led away from the fact that no honorable individual or firm wishes to collect in advance for an untried article, and any one wanting to do so can generally be rated as a first-class fraud. Nealy all responsible oil houses will generally supply all the oil that is needed for a fair trial free of charge."

A Well-Managed Blacksmith Shop.

The blacksmith shop connected with the Pittsburg Locomotive Works is one of the best equipped and most intelligently operated blacksmith shops we have ever seen. Where small, light work is exclusively done, one occasionally comes across a shop with admirably-arranged appliances for all operations; but here is a shop turning out all kinds of forgings, light and heavy, plain and complex, and every job is facilitated by special tools and formers. The shop is an oblong one-story building, excellently lighted, with the fires and furnaces ranged along the walls, and a row of hammers along the center. Cranes that can be handled are placed all over the shop, in sizes adapted to the work done at the points where they are stationed. There are six steam hammers, ranging in weight each from 3,500 to 500 pounds. The boilers that supply steam to the hammers are placed above the furnaces, and they are so set that the furnace can be rebuilt or repaired without disturbing the boiler setting. Those who have to move a boiler every time a furnace of this kind is repaired, will appreciate the advantage of this arrangement.

A very large number of the forgings used in locomotive construction are made under formers, and many of the pieces thus produced look as smooth and clean as fine drop forgings, and the material to be removed in tool finishing is extremely light. The work of these forming dies is almost exclusively done under the steam hammers. Links, link saddles, rod straps, ends of braces, draw-bar ends, are among the articles turned out from the formers.

The same means are used on forging rocker-arms and other difficult pieces, but in this case the two arms are welded together at the shaft. The formers are made of cast iron, and they find that dies made from this material give more satisfaction than similar dies made of wrought iron. Plaster of Paris patterns are used to mould the dies from, and they are made very heavy to secure endurance. Mr. David Miller, foreman of the shop, is an intelligent reading mechanic, who takes a comprehensive interest in blacksmith work, and much of the success of the methods followed in this shop is due to his zeal and ability.

Among the work which we observed on the floor of the blacksmith shop was some sets of heavy frames for Baltimore and Ohio consolidation engines. These frames were peculiar, in so much as the jaws were cut out of a solid bar, which was rolled wide enough to admit of the whole frame being cut out like a template out of a sheet. The railroad people who ordered these locomotives seem to think that making frames in this way is to secure greater strength than would be obtained from the ordinary plan of welding the pedestals to a stub on the top bar of the frame. We think they are wrong, and that they will find frames cut out of a solid bar will not prove so strong as those that are welded; for by the new plan the strain on the jaws will be in line with the grain of the iron, and they will be weaker than a welded jaw, where the strain comes across the fiber of the metal.

The *Slate Trade Journal* says:

"The science of economical construction is destined, like the science of geology, to play an important part in the management of slate-quarrying enterprise in the future. Experience has taught, in many cases, if science has not, that it is not profitable, as has been the practice, to erect the cheapest machinery and buildings, with the cheapest materials and the cheapest labor, without reference to any other object than the immediate purpose. Economical construction involves the idea of cheapness, not exclusively, but in conjunction with all the other elements of permanent economy. For illustration: It may be cheaper for the time being to erect an old worn-out stationary engine for hoisting purposes; the one object only—small first cost—is gained; the main points, and those which will effect economy, have been overlooked. This engine will consume double the quantity of steam; it will require constant repairs and attention; it is liable to break at its weakest and worn parts; it will seldom be in good condition to respond to the demands of it for the work it was intended to do, and thereby causes constant delay and unnecessary expense. It is false economy, as well, to erect an engine or other piece of machinery of much greater power or capacity than is needed to do the necessary amount of work. It is a useless waste of power to run it, of material to make it, and labor and time to handle it. The most economical machine is the one proportioned and adapted to its work, and constructed in the best and most workmanlike manner. This requires a knowledge, in the first place, of the amount of work that will be required of the machine during the period it is destined to run; in the next place, the greatest strain to which it will be subjected must be known, so that the parts may be proportioned to withstand such strain without injury. It must be properly erected, and connected so as to have proper speed, motion, etc. The services of the expert machinist will be required to do all this properly, but it is real economy to employ his services first, not last.

Threading Tool for Sharp V, U. S. Standard and Whitworth Threads.

Threading tools in which the cutter, accurately made to standard, does not change its form by grinding are a great improvement over those which the workman must grind to shape, because they save time and insure greater accuracy in the work done.

The engraving represents a tool of this kind made by the Hartford Tool Company, Hartford, Conn. The holder is made of machinery steel, case-hardened, and will, in addition to the various standards of threading tools, hold, if desired, other forms of small shaping tools.

It is a well-constructed tool, offset so as to cut close to a shoulder, and a tool, we believe, that will be appreciated by machinists.

Steel Cruiser Atlanta.

The new steel cruiser Atlanta, built for the United States Navy by John Roach & Son, is lying in the East River at the wharf of the Morgan Iron Works, where the machinery and boilers for the vessel are being constructed. The vessel is as jealously guarded as if she were a secret machine belonging to a close corporation. After a great deal of persistent effort, we succeeded in getting an order that enabled us to look round the ship. The vessel is interesting as being a contribution towards a United States Navy, but she is the homeliest craft of the man-of-war tribe that we have ever seen, and we have seen several ships of the kind that were far from handsome. The bow is ram-shaped, slanting backward towards the crest at an angle of about 30 degrees. Nearly the whole of the main deck is covered with a house about 10 feet high, having protruding half-circular turrets at the sides. The vessel is 276 feet long at her water line, and 270 feet between perpendiculars. She is 34 feet deep, and her breadth of beam is 42 feet. She will draw 18½ feet of water, and her displacement capacity is 3,000 tons. The hull is divided into 72 water-tight compartments. There are 8 complete transverse water-tight compartments, and on the sides through the boilers' space are longitudinal bulkheads. Under the machinery is an inside water-tight bottom. There are 12 water-tight cells between the two bottoms. The Atlanta will carry two 8-inch long rifle guns, which will be mounted on barbettes; six 6-inch breech-loading guns, and eight revolving guns.

Hardening and Tempering Steel.

By S. W. Goodyear.

I have had some trouble in hardening steel, and having noticed a very strange result growing out of apparently no sufficient cause, I feel like laying the matter before practical mechanics for explanation. A plain statement of the case is this: For a number of years I have been in the habit of hardening, or having hardened for me, pieces of cast steel of 1½″x1½″x⅞″. These pieces were with plain sides and edges, but with one end convex and the other end concave from a radius of ½″ parallel with the width of the pieces. The corners were well taken off all around. The only provoking cause for hardening cracks was a hole of ¼″ diameter and ¾″ deep in one edge, about 1″ from the convex end. Repeatedly these pieces had been made and hardened in sets of six with no such thing known as a crack starting from this hole. A set of six were ordered by a customer to be just the same as the regular standard size and shape in every way, except that they were to be ¼″ wider. They were made and hardened by the same men and at the same time with three other sets of six each of the regular width. These eighteen have remained sound, while the other six, supposed to be precisely the same except that they were ¼″ wider, all of them broke shortly after being put into use, showing unmistakable evidence of having been cracked in hardening. The broken pieces were replaced with others, which soon failed in the same way. These in turn were replaced with a third set, but with the hole referred to drilled after the hardening had taken place; this was some time since, and I have heard nothing from them, and have no doubt they will prove sound.

Can some expert in steel working answer the question presented by this statement of facts, *i. e.*, why did the adding of a quarter of an inch to the width of these pieces cause them to crack in hardening, when the standard width of 1½″ could be hardened safely? These pieces, so far as I know, have broken entirely through crosswise at the hole mentioned.

Is it not strange that certain steel workers—tool dressers—should persistently refuse to see any merit in certain brands of steel, always being found ready to condemn as of no value steel which, in the hands of other men, properly worked, is constantly proving, when put in use, fully equal or superior to their own favorite brands? In a letter which you published some time in August, 1883, I referred to the success which "Jim," a tool dresser, was having with a high grade cast steel. The steel to which I referred was of a well-known American brand, and "Jim" is still making from it lathe and planer tools to the entire satisfaction of the firm who employ him, and the mechanics who use the tools as well, while there have been many cases in which work has been with these tools not simply done more economically, from the greater durability of the tools, but has been done without difficulty, when it would have been impossible to do it at all with the old favorite English brand formerly in use. To offset this very satisfactory result, following Jim's instruction and practice, I know several other steel workers who declare that they have given this steel a fair trial, and found it good for nothing. "They treated it just as they would their old favorite brand, and it cracked in hardening and broke in use under slight strain, when the temper was down as low as it was possible to have it and retain sufficient hardness to cut. Where is the difference? Jim was willing to learn at what heat the steel should be worked and hardened, and having learned, was willing to adopt the lower heat required, regardless of what had been supposed to be the proper heat for the old favorite brand, while those who condemn the steel have tried to make it stand the same heat which they have applied to their favorites. They heat steel to a yellow bordering on white for working, and harden at a heat not much less. Jim works the steel of which I am writing only at a red bordering upon yellow, and hardens it at a red, and if the piece is small a very low dark red at that. He formerly heated steel just as hot as these other men when he used the same brands and temper which they are using. If he should go back to the old brands, he would not heat them as hot as he formerly did. If all these men who condemn Jim's favorite steel would heat their own favorites at lower heats, they would find that for many uses—as good as they have considered the steel, and as well satisfied as they have been with their treatment of it—they have fallen far short of what the steel is capable with proper treatment. This broad statement may prove offensive to some steel workers. My reason for making it is this: I know beyond a doubt that the steel used by Jim will do all that is claimed for it. I believe that any good tool steel to do its best must be worked at a heat not too high, and hardened at the lowest heat at which it can be sufficiently hardened. I believe that men who have been in the habit of experimenting with *any* steel until they have got the best results of which it was capable, must have learned that which would lead them, when a steel of higher temper was presented to them for trial, to test it in such a way as to bring out the superior quality for *some uses* growing out of the higher temper, instead of condemning it broadly because it will not stand the same heat as the steel of lower temper which they assume to know exactly how to work, but which they compel to stand more heat than is possible for it to stand and be at its best.

In no part of manufacturing and mechanical practice is the *superlatively best* of more importance than in the quality of tools used. Herein lies the excuse of any man who attempts to reform the practice of many steel workers, who seem to judge of the good or bad qualities of steel by the amount of heat it will or will not stand and prove comparatively good, rather than to learn how low a heat is sufficient to put the steel at its superlatively best. There is much involved in the question: What is the difference between tools made from best steel with utmost care, and those made from inferior or comparatively good steel in the careless manner so prevalent in many shops? The difference begins with first cost of material, which may be augmented for any given length of time by the purchase of too low-priced steel, or the improper treatment of *any* steel, to from 10 to 95 per cent. But this is a small item compared with the needless addition to the labor account which comes from the life of tools when put in use falling far short of what it should be, necessitating not only their replacement by new ones, but causing an immense outlay in time in the grinding and constant repairs to which they are subjected from the very first. When, as is sometimes the case, a report comes from a workman that some particular tool has stood

to work continually as many days as the ordinary tools of the same style have stood hours, or a tool is pointed out as having stood all day without grinding or readjusting, when the practice had been to grind at least once an hour, why should we look upon it as accidental? Why should we not ask, if these tools can perform such a wonderful amount of work, why, if ten minutes wasted in grinding and readjusting for each hour in the day can be saved in the one case, why not investigate and learn how to make it the rule, instead of treating it as an exception bordering on the miraculous? There would be "millions in it."

Always feeling deeply interested in the working of automatic machinery, I once stood admiring the working of a particularly intelligent machine of this class, when, with a crash and grind, it came to a standstill, and the operator came quickly to extricate the bent and bruised wires which had clogged the machine and caused the stoppage in an instant almost, owing to the breaking of an insignificant-looking little piece of hardened and tempered steel. Said the operator: "If that little piece would not break, the machine would run from morning to night; but with the best steel we can get for it, and temper drawn clear down, that little thing won't stand. Sometimes they last an hour or two; in exceptional cases they may last all day; sometimes they don't last fifteen minutes." Here was a chance for experiment. At my suggestion a new piece to take the place of the broken one was hardened at a very low heat, so much lower than it had been the custom to use that when I said, "That is hot enough," the reply was, "It won't harden at all at that heat." But it did, though, and being drawn to a straw color, instead of the blue which had been considered necessary, it was put in its place and the machine was started. Three weeks later, on meeting the operator, I was told that the piece was still doing duty, apparently as good as new.

A special meeting of the Hoe and Fork Makers' Union was recently held at the Tifft House, Buffalo. It is an association made up of about twenty companies and individuals engaged in the manufacture of steel farming implements, and its object is the regulation of the trade in the controlling of prices and the pooling of interests.

Medium Size Tenoning Machine.

The engraving represents one of the sizes of a new machine of this class, made by the Egan Company, 201 to 221 W. Front Street, Cincinnati, Ohio.

The frame of this machine is a pedestal cast in one piece, making a suitable and convenient support for the belt pulley.

The arbors are of steel, running in babbitted boxes, carrying heads of small diameter which run at high speed, making a clean shear cut.

The heads can be lowered or raised simultaneously or independently, as desired, by the operation of a single handle, one head, or both being raised or lowered without letting go of the handle.

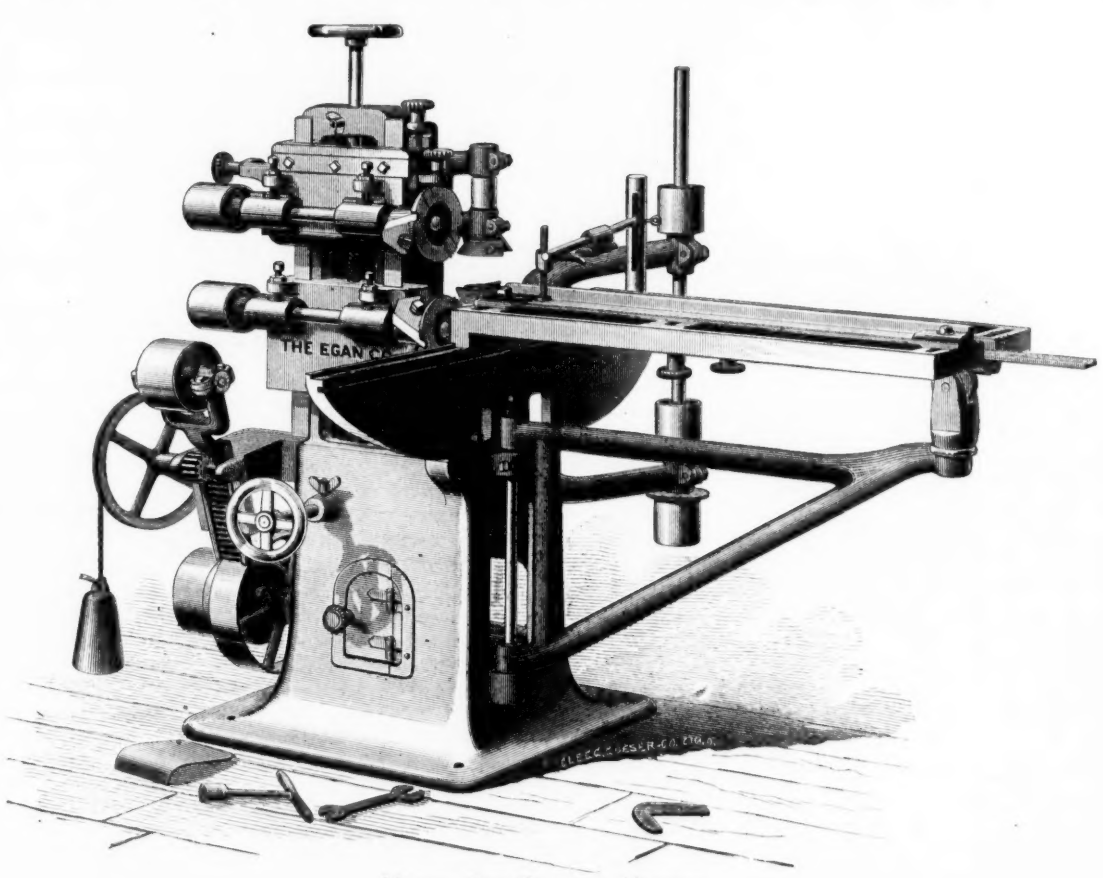
The upper head, spindle and boxes are adjustable horizontally in dovetail slides, thus enabling the cutting of one shoulder of the tenon deeper than the other.

The driving pulleys come close to journals; the belt runs with clearance, and is strained by tightener.

The table is arranged to work easily and quickly, being light and strong. It has stops for getting exact length of tenon to be cut; the arrangement is such as to permit no impediment to the operator walking beyond the heads, in cutting a tenon, thus avoiding leaning forward and virtually losing control of the piece. The outer end of table is sustained by a novel combined swinging pivoted frame, giving an easy, swinging motion. When extra long stuff is being operated upon the extension-bar can be adjusted to suit. The table is gibbed under the slides, thus avoiding all possibility of the end being thrown against the cutter heads.

This machine is recommended by the builders for cabinet makers, furniture manufacturers, carpenter shops, planing mills, etc., and is easily adapted for chair, wagon, spoke, and other work; cut-off attachment is provided when required.

Either one or two copes may be used with the machine. The copes have independent lateral and vertical adjustment and are driven by long belts.



MEDIUM SIZE TENONING MACHINE.

American Steamers that May Change Their Flag.

The intimation is given that the International Navigation Company, of Philadelphia, which recently purchased the four American-built steamships of the American Steamship Company, and which assumed that company's agreements with the owners of British vessels, all of which have been and still are run between Philadelphia and Liverpool under the title of the American Line, is seriously considering the running of American-built steamers under the British flag, instead of the Stars and Stripes. The owners say that patriotism alone induces them to delay the change, for they could run the steamers at a very considerably lower cost under the British flag. While they run under the American flag, they are compelled by law to ship the crews in American ports, and by so doing they have to pay much higher wages than is paid by their rivals of Europe. This, they say, prevents them from competing on even terms with foreign steamers. If we remember rightly, the owners of this line once made the assertion public that the principal obstacle they experienced in competing evenly with foreign rivals was the law which prevented them from buying cheap foreign-built steamers.

In his experiments with the action of steam in cylinders some years ago, Clark found in extreme cases that 50 per cent. of efficiency was lost through condensation in the cylinders alone. His remedy was steam-jacketed cylinders, but where this arrangement has been used with high-speed engines, especially locomotives, the practical saving has not approached the theoretical calculation. Steam-jacketing has been found more efficacious with compound than with high-pressure cylinders.

Early Engineering Reminiscences.

BY GEORGE ESCOL SELLERS.

NINTH PAPER.

There can be nothing more instructive and important to the civil and mechanical engineer of the present day than to take a comprehensive retrospective view of the advances made during the years, say from 1817, when De Witt Clinton started the first great American school for engineers by breaking ground for the New York and Erie canal, which was opened for public use in the latter part of 1825. This great work may aptly be called a school, for we all know how much the country has been indebted to the many eminent engineers who took their first lessons in its location and construction. At the time this work was progressing the Government was pushing forward its great work, the National macadamized road from Washington and Baltimore to Wheeling, and through Ohio via Columbus to the Northwest. Although it was under the special charge of officers of the engineer corps of the United States Army, it was a school for many civilians. Unfortunately for the country it was never completed as originally projected, the work being suspended for lack of appropriations.

At an earlier date, England, and a considerable portion of the Continent of Europe, were agitated on the subject of transportation. The success of the English canals in advancing commerce and manufacture, had aroused the people to the importance of more certain means of transport, summer drought and winter freezing interfering with steadiness and certainty. It was not until about the year 1823 that the merchants of Liverpool and manufacturers of Manchester became fully aroused, mainly through the persistent agitation of the subject by a Mr. Sanders and William James, a civil engineer.

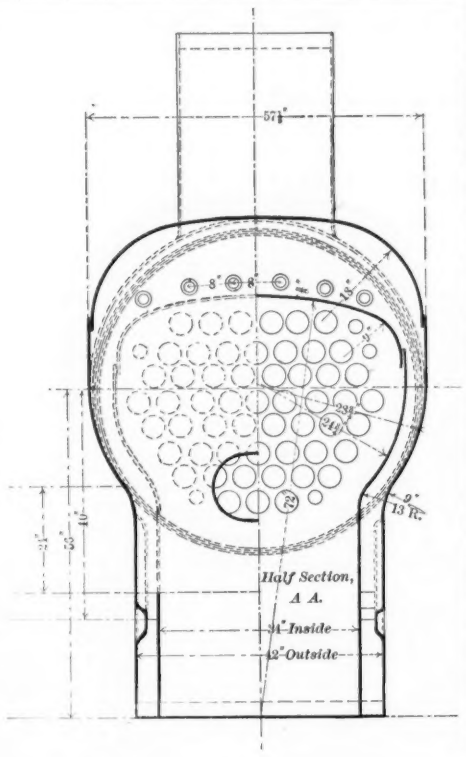
What I am now writing is entirely from recollection, as I have no notes of that early date by me to refer to; but although memory is not always infallible, from the novelty of the circumstances and the vivid impression made at the time, I feel confident of the correctness of what I am now about to relate. Wirt Robinson, nephew and chief assistant of Moncure Robinson (who was at that time chief engineer engaged in the construction of the Richmond & Fredericksburg railroad of Virginia) was sent to England to examine the question of locomotive power, and to contract for engines for that first Virginia railroad. In company with him, I had visited all the shops that at that time were building locomotives, and he had contracted for several, one of which was being shipped on the Philadelphia packet ship, Algonquin, on which we had taken our homeward passage. Some accident delayed the starting of the vessel for about a week; and although we had already been over the Liverpool and Manchester Railroad, all of this week's delay was devoted to examining it and its locomotives more in detail, often accompanied by engineers connected with the road. We had several very pleasant interviews with George Stephenson, who afforded us every facility. At that time he was having constructed for America a number of full crank four-wheel complex locomotives, with the cylinders under the smoke box, without either trucks or pilot wheels. He explained very fully his train of reasoning and his experiments that led to his adoption of tubular boilers. He was no doubt the originator of the multi-tubular boiler to which the great success of the present system of locomotive engines owes so much.

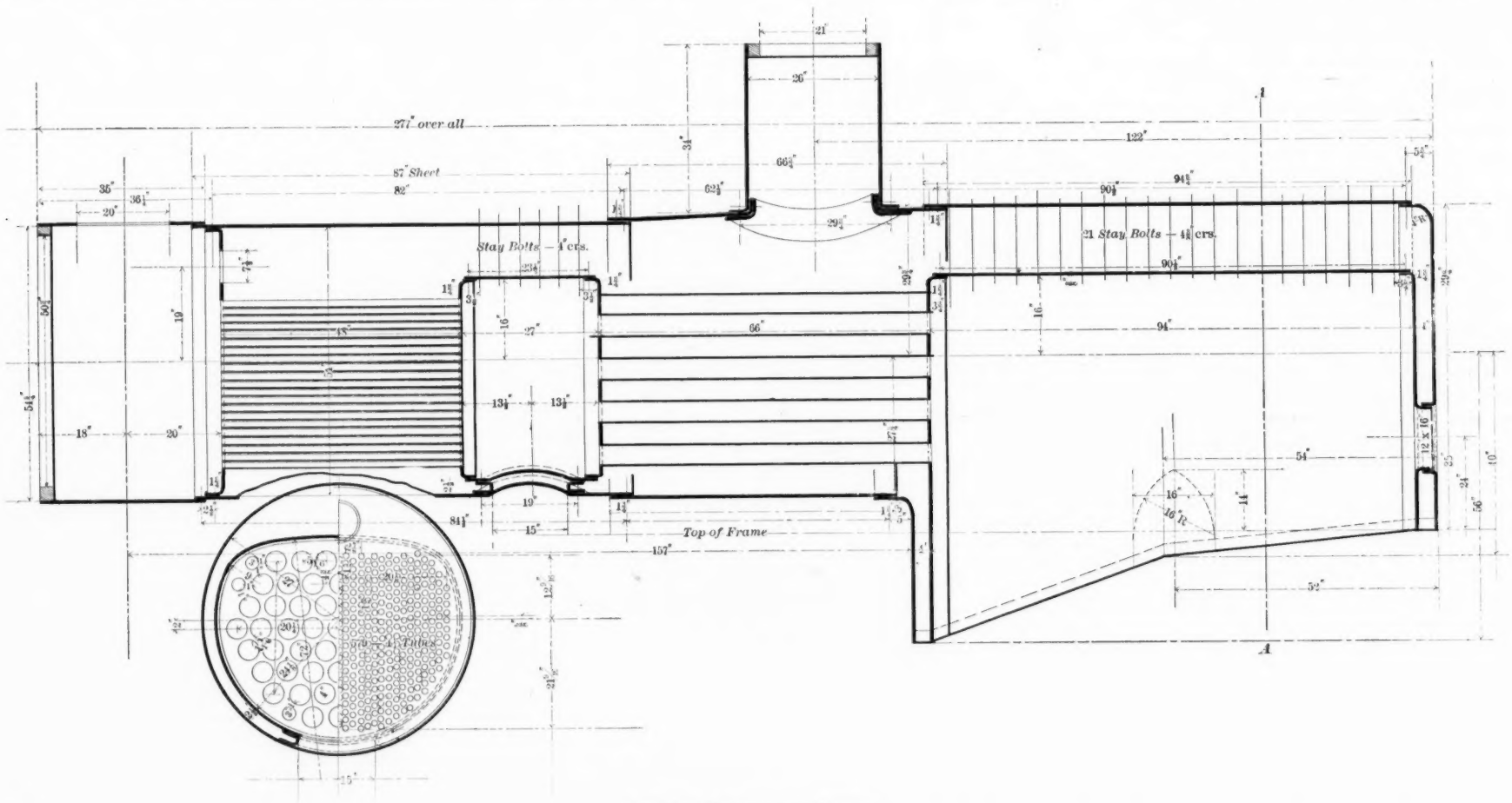
On one occasion, in company with a number of engineers, a Mr. Hartley—I think at that time engineer of the Liverpool docks—was calling our attention to points of interest, explaining difficulties that had been encountered and overcome, when I incidentally referred to Mr. Stephenson as the original projector of the road. To this Mr. Hartley replied that Mr. Stephenson's partial success with the Killingworth coal-hauling engine in 1814 or 1815, and more perfect success with Helton colliery engine in 1822, and Mr. Hedley having demonstrated the practicability of drawing loads by smooth wheel traction as early as 1813, was used as strong arguments in favor of Mr. James' project of a railroad from Liverpool to Manchester, which had been taken up and advocated by Mr. Sanders in a pamphlet published by him in 1824 (a copy of which was given me on our return to Liverpool). I was also shown a paper setting forth the difficulties of reliable transportation by the canal between Liverpool and Manchester, owing to seasons of low water and winter freezing, and that a new line with certainty and economy had become an absolute necessity for the rapidly-increasing trade of the country. To this paper were subscribed the names of a large number of prominent merchants, brokers, and manufacturers of both cities. If I recollect right, this was a kind of a call for a meeting that took place, and at which it was decided to form a company to build a double line of railway from Liverpool to Manchester. A copy of the prospectus of this company was also given me; it was issued in the fall of 1824. Mr. Hartley said he had taken the pains to show me these evidences, to disabuse my mind of the impression that the road was the outcome of the working of a single mind, and that many active minds were looking and working in the same direction; he looked upon the road as an inevitable sequence of necessity. In speaking of the early and efficient advocates of the road, he referred to Mr. Huskisson, M.P. from Liverpool; Mr. James, George Stephenson, and Mr. Sanders—the latter having devoted both time and money to the agitation of the project. Mr. Huskisson was killed by be-

coming confused and stepping on the wrong track at the time of the great celebration of opening the road, September 15, 1830; he was run down by the locomotive "Rocket." This sad accident caused a profound sensation throughout the civilized world. We in America had learned of the success of the first railroad opened for public traffic, the Stockton and Darlington, operated by locomotive power in 1825—the year the work on the Liverpool and Manchester was commenced, and we watched with intense interest the progress of that great work. As reports of it from time to time reached us, they were seized with avidity and discussed through the length and breadth of our country. It was looked on as a gigantic experiment that would settle the question of railroad transportation. I believe we Americans had more faith in its success than the generality of Englishmen at home, and this was evidenced by works being commenced in the United States before its final completion. It seems strange to us, and hard to realize, that as late as 1829—less than a year before the regular opening of the road—the directors had not decided on the application of the power to be employed to move their trains, they being about equally divided between stationary engines with long ropes and locomotive engines. They sent engineers to examine the operation of the Darlington and Newcastle railways, directing them to look carefully into the advantages and disadvantages of each mode of conveyance, to accurately note the cost, and report fully. This report was so much in favor of locomotives that it convinced a majority of the directors, and brought forth that memorable prospectus, with stipulations and conditions, with the offer of a premium of £500 for the most improved and effective locomotive not to exceed in weight *six tons*, issued by the company April 25, 1829.

As this seems to be generally admitted as the starting point of the successful locomotive, it is presumable that all engineers are familiar with its conditions; it is, therefore, needless to refer to them in detail. We all know that George Stephenson's "Rocket" took the premium, and he got the contract to furnish the motive power, and by the time of the great opening pageant—September 15th, 1830—he had eight locomotives to draw the eight trains of four carriages each, with from twenty to twenty-five passengers to a carriage, furnishing seats for nearly 800 in this brilliant cortege. It has been estimated that, with officers of the road, engine drivers, stokers and train hands, from 900 to 1,000 people were carried by the eight locomotives on that memorable occasion, from which dates the successful operation of our modern railroads, but little more than half a century ago. And now we can travel the world over on the iron road, a single locomotive often drawing greater weights than the entire eight engines did, and at constant speeds of more than double that then obtained in the fastest spurts then made.

I have searched over many old papers and as yet have failed to find a unique letter that I would like to give to the readers of the AMERICAN MACHINIST. It was from a friend in England, giving an account of his journey from his home at Birmingham, by stage coach to Liverpool, to take part, as an invited guest, in the great celebration, which he anticipated would be a new-fangled failure. His descriptions were graphic, and, as one who witnessed the accident that caused the death of Huskisson, his comments on it, and fears expressed as to the *insurmountable difficulties* and dangers attending railway travel, as compared with stage-coach, though admitting the advantage as means of transportation of heavy burdens, believing that a speed of twelve miles an hour might be reached with safety—and that would be thrice that allowed on the canal—a sufficient advance to satisfy the most hopeful of the credulous. The written thoughts of thinking men of the time become of great interest to the engineers of the present day, and particularly to those who may yet be living who have, with the present writer, witnessed the early inception of the railroad and the locomotive, who have taken part in and watched the steady and rapid progress to the present grand perfection, and can bear witness to American energy, the skill and perseverance of her civil and mechanical engineers, which have done so much to lead to that perfection.





STEVENS' LOCOMOTIVE BOILER.

An Easy Test for Lubricants.

The manager of any mill may, at very little expense, determine for himself all the conditions of safety and economy in lubricants as indicated by the standard of heat developed upon any given shaft. The apparatus required for this purpose is merely a thin brass tube closed at the lower end, and two thermometers. The method of using this apparatus is as follows: Place enough water in one of these tubes that the bulb of the thermometer will be immersed; insert the tube in one of the holes in the cap of the journal, so that the lower end of the tube will be in actual contact with the shaft, hang the other thermometer free alongside; then gauge the relative heat developed with oils and with greases. Each man may thus satisfy himself as to which is the best and safest.—*Saw Mill Gazette.*

LETTERS FROM PRACTICAL MEN.

Stevens' Locomotive Boiler.

Editor American Machinist:

I notice in the AMERICAN MACHINIST of November 15 an article relative to the Coventry locomotive with the return tube boiler.

I wish to state, for what it is worth, that boilers of this style were built by Mr. C. W. Stevens as far back as 1859, and were used upon the Market Street Railroad at San Francisco. They were small, but large enough to determine their value as compared with the ordinary locomotive boiler. There were four engines—wood burners—two with the return tube boiler and two with the common locomotive boiler. The latter did very much better work than the former, steamed more freely, and burned by far the least fuel. The return tube boilers were considered a failure. In the case of the Coventry boiler, if it was built to burn coal, I think it would do very much better if the tubes were leading from the furnace instead of from the forward connection of the smoke arch. However, I do not believe a boiler of this description will ever prove successful.

I send you by mail to-day a blue print of a boiler that we have had running upon this road for a short time. It is possible that boilers like this may have been built heretofore, but I have never seen nor heard of any. I hold a patent for steamboat and stationary boilers built on a somewhat similar plan, only that they have return tubes and an upper center chamber placed right over the lower one. There are flues from nine to seventeen inches in diameter leading from the furnace to the lower combustion chamber, and from there on to the back connection and return to the upper center combustion chamber, thence to the up-takes. Four-inch tubes are used. There is also a row of tubes connecting the lower combustion chamber with the upper, to admit of the flame passing from the lower to the upper chamber by a short cut, for the purpose of prolonging or keeping up the combustion of the gases. These boilers are working splendidly, and have been in use for about twelve years.

You will observe that the locomotive boiler (blue print of which I send you) is fitted with four-inch tubes from the furnace to the combustion chamber, and from there to the smoke arch with one and one-quarter-inch tubes. It is calculated that the gases will all be burned before they reach the smaller tubes, which seems to be the case in actual service, so far as we have experimented, as but very little black smoke is emitted from the stack at any time, and then only when fresh coal is put in, and will not continue more than a few seconds. My idea is that the gases will burn freely in a four-inch tube where the flame would be extinguished in a two-inch tube, or in a tube such as is usually used in a locomotive boiler. As long as we have run this engine we have never seen a spark of fire coming from the stack. She is worked under 140 pounds of steam, and steams very freely, and so far has made an average of 33.50 miles to the ton of Pacific coast coal, which is very fine; nine-tenths of it would pass through a screen with one-half inch mesh. You will observe that I have dispensed with the use of crown bars, and

have stayed the crown sheet with screwed staybolts. A. J. STEVENS,

General Master Mechanic, Central Pacific Railroad, Sacramento, Cal., November 11, 1884.

A Portable Cupola—Reducing the Face of Gear Wheels.

Editor American Machinist:

I am indebted to a gentleman who has had a life-time experience in the foundry business for this description of a portable cupola, to be used in case of emergency in foundries where they do not cast every day, or where they are repairing the larger cupola.

Figs. 1 and 2 present two views of the base. The bottom, *A*, is cast solid, with a rim 1½″ deep all around the outside, except where the spout *B*, *B* is bolted on. The legs *C* are cast separate, and bolted on. Fig. 3 represents a detachable body, made 24½″ outside diameter, 18″ inside the brick, and 36″ long. It has a wrought iron bail riveted on with sockets for shanks, *D*. The dotted line at bottom of body represents a flange to support the brick lining. At *E* is a tuyere hole. Two Tuyeres can be used if desired, and connected by hose with blast pipe. A semicircular arched hood can be attached to the top of the body in front, which will carry the sparks all out at the back.

After the body has been daubed up it is lifted on the base and the sand bottom and breast is put in the same as in an ordinary cupola. From 1200 to 1500 pounds of very fluid iron can be melted in this cupola, with a small percentage of fuel.

In your issue of November 15th, Mr. Geo. O. Vair calls attention to an excellent plan of reducing the size of a gear wheel by building up from the bottom. I have practiced that plan, but, in point of time gained, prefer the plan given in your issue of October 5th. I believe moulders who have tried both methods will agree that in making a gear wheel six to eight feet in diameter, it will take less time to strike the rim off from the top than to get all the sand out from between the arms, draw up the pattern, tuck under the rim, fill up between the arms again, and then strike off the center, when the same strike will cut down the rim at once. In cutting down large solid pinions the filling-up process cannot be practiced, and when the work has been performed in a mechanical manner we have not been troubled with "fins." ROBERT E. MASTERS.

Tendency of Curved Tubes to Straighten.

Editor American Machinist:

I cannot agree with your correspondent, A. F. Nagle, in the issue of the 29th inst. relative to the tendency of tubes of curved form to straighten under internal pressure. He denies this tendency in tubes of circular cross section. Now, as I understand the theory, if a closed vessel of any shape be submitted to internal pressure, its sides will tend to assume such outline as will allow them to enclose the greatest cubical capacity; and as a circular tube will contain more if it be straight than it will if bent in any degree out of a straight line, the bent tube will tend to straighten out under internal pressure, in the endeavor to receive all the contents which are being forced into it. The elliptical form is preferred for pressure gauges as being the most sensitive to pressure consistent with strength.

If Mr. Nagle will attach his garden hose to the hydrant cock, put a cap on the free end, coil it up on the ground and let on the water, he can soon satisfy himself on the point under discussion. SIX H.

A factory has just been opened in Danbury, Conn., by Frederick Euvard & Co. for the manufacture of wooden shoes. Euvard is a German, and for some time has supplied the brewers in New York with wooden shoes for their employes, and the demand has now become so extensive as to require much greater facilities and the aid of steam power. The shoes have the approved curved round toe of the old Dutch style, and are heelless. They are made wholly of the wood of the butternut tree, and, while impervious to water, are also very light. They have been introduced into all the hat shops for the protection of the feet of operatives from the wet floors, while at the same time they are very easy and rest the feet.

Breakage of the Dolphin's Crank-Shaft.

The new dispatch boat Dolphin, recently built by John Roach & Son for the United States navy, was taken out for a trial trip last week, which came to an ignominious and premature finish by the breaking of the crank-shaft. Something like a holiday crowd went out to witness the trial of the boat's speed, several members of the Naval Advisory Board and other smaller naval luminaries having shared the joys and sorrows of the trip. The vessel developed remarkably good speed. While only 15 knots an hour were expected, the boat steamed 16.4 knots an hour. Instead of one-mile trial of speed, as is usual in testing the power of boats, this one was run for six hours at full speed along the coast of Connecticut. When the party got opposite Clinton, and were about ready to return, the crank-shaft snapped at the first coupling abaft the thrust bearing, leaving the boat helpless on a lee shore. Fortunately, the weather was calm, and nothing worse happened than keeping the party floating round for twenty-four hours before assistance arrived.

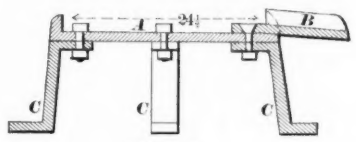


Fig. 1

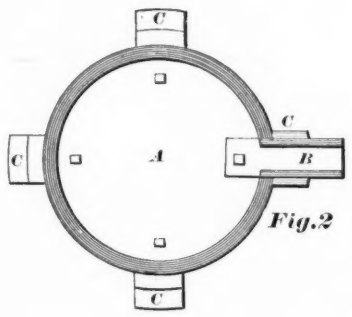


Fig. 2

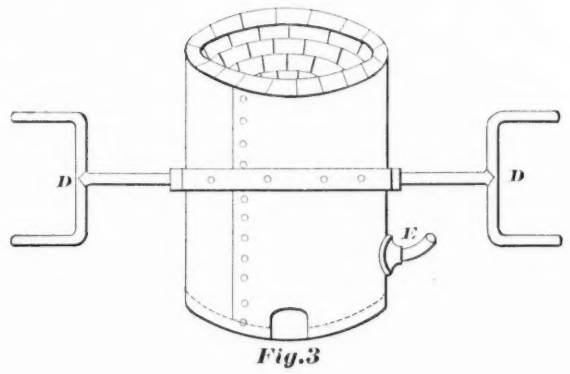


Fig. 3

The shaft which broke was of open hearth steel, and was made by the Nashua Iron and Steel Company, the high character of the steel usually turned out by that firm having contributed to give them the contract for this job. The shaft was made in sections, and the part that broke was 26 feet 7 inches long and 16 inches diameter, the coupling flanges being 31 inches diameter and forged on the shaft. Six steel bolts, 2½ inches diameter, were used to secure the couplings, and in the middle there was a cross-key, 2½x3 inches, recessed 1½ inch in each coupling. The break occurred close to the coupling, and the fracture left a disk the size of the flange, with a rough, conical hole torn in the center. An inspection of the piece reveals the fact that the metal at that spot was of extremely bad quality, having a coarse, spongy appearance. The inferior steel was confined to a small spot, for the shaft turned up clean and smooth, and was closely inspected by a United States naval engineer, who has been intensely careful about rejecting any material not up to the high standard required. We examined the flange that broke, and, although the key-seat went in well towards the point of fracture, no appearance of defects in the material was visible there or about any part of the shaft that could be seen. In fact, to outward appearance, the shaft was as fine a piece of steel as a mechanic could desire to see.

The breakage of this shaft is an unfortunate occurrence just now, when public opinion is veering towards a demand for increasing the navy; but the case might have been worse, and the case is by no means unparalleled in the history of steel-making. In fact, the fracture of propeller shafts is one of the commonest accidents to steamships, and this one happening, as it did, on the trial trip, is no justification of the storm of jeers, derision and abuse heaped upon all concerned by the daily press, strong from the training of the heated political campaign.

An Ingenious and Useful Machine.

Sterling Elliott, of Newton, Mass., has perfected a machine for stitching pamphlets and unbound books, which, it would seem, will induce a revolution in this kind of work. It does the work in a fraction only of the time required by existing methods, and in a superior manner. The machine is a model, not only for the neatness, accuracy, and rapidity with which it does its work, but for its fine mechanical conception and construction and the almost human action of its mechanical movements. The thread or cord with which the stitching is done is unwound from a large stationary spool, and passes through a tension device similar to that of a sewing machine, but there are no needles to thread, nor in fact much similarity between the two machines further than that of the tension. All the preparation necessary is to pass the thread between the tension disks. The pamphlet to be stitched lies underneath a slotted plate. In the operation of the machine the thread is taken hold of about as it would be by the thumb and finger of the hand, and stretched along the top of the plate directly over the slot. Then three needles pass up from underneath through the leaves to be stitched, and one after the other take hold of the thread, carry it down through the leaves, and form three loops on the lower side. What would answer for the shuttle of a sewing machine then passes forward through these loops, and, seizing the thread, returns with it, when by the most ingenious of all the operations a *square knot* is tied at the end, between the leaves, the thread being drawn taut. An arrangement reminding one of the operation of a pair of scissors is at one end of the throat plate, which at the proper time cuts the thread to exactly the length required. The details of the machine are worked out in such a way as to make failure to act properly almost an impossibility. One of these machines has been on exhibition at a large bookbindery in this city, where it has been doing regular work, giving the most perfect satisfaction.

A new steamer of 5,000 tons has just been launched in England for the service between London and New Zealand. Besides the extensive refrigerating arrangements, enabling her to carry 500 tons' weight of meat, the remarkable thing about her is the high pressure of her "triple expansion" engines. These are made to work with the steam at a pressure of 160 pounds to the square inch, the highest rate yet reached in ocean-going steamers. The saving in coal is estimated to be 800 tons on the round trip.

Calculated Cost of Operating Railroads by Electric Motors.

The announcemont made by Cyrus W. Field at the shareholders' meeting of the New York Elevated Railroads, that he believed electric motors could be used more economically than steam locomotives on the elevated railroads, has infused new life and activity into all the companies controlling electric motor patents. As the representatives of each patent electric motor claim that their particular machine is a little better than any other for applying power on railroads, there was imminent danger that the energy needed to convince railroad managers that electric train operating was practical might be expended in a conflict of claims for superiority. This waste of moral power has been avoided by an agreement made by five of the leading electric motor companies, to form a single company for the purpose of combining the usefulness of the various motors. Representatives of the different companies met recently in New York, and arranged the preliminaries of the new company. It was resolved that the new company should have a capital stock of $1,000,000, one-half to be paid in cash and the other half to be apportioned among the owners of the five different motors, according to their ascertained relative values. The representatives of these motors agreed to submit the question of relative values to a commission to be composed of the following gentlemen: Prof. Sir William Thomson, of Glasgow; George B. Roberts, president of the Pennsylvania Railroad; James H. Rutter, president of the New York Central; Robert Harris, president of the Northern Pacific Railroad; and Charles R. Cross, Professor of Physics in the Massachusetts Institute of Technology, at Boston. This commission will be asked to investigate the merits of each of the five motors named, and grade them according to their practical worth. The avowed intention of the new company is to get not only the best motor, but also to utilize the best features of the different motors.

Most of the motors represented in this new combination have been experimented with far enough to show that railroad trains can be moved by them if power enough be applied, but the patentees have been careful to prevent the public from learning just at what expenditure of power the work can be done.

The claim for superior economy over present methods is based on the calculations that good stationary engines, which can be used to generate electricity, will burn a small proportion of the coal used by locomotives, and that the motor will be so much lighter than a steam locomotive that great saving will be effected in the reduced dead weight. Most of the calculations assume that locomotives consume ten pounds of coal or more per horse-power per hour. We believe this is a fatal error, for we have good reason for saying that the work on the elevated railroads of New York is done with half that coal consumption. The weight of the locomotives, and the additional coal they use over a good stationary engine, will be more than balanced by the loss of transmission of electricity. M. Deprez, an accomplished electrician and a warm advocate of electrical appliances, has demonstrated with exactness the loss of electricity in transmission. He found that a current of electricity equivalent to five horse-power could be sent ten miles and back with a loss of 29 per cent. This did not represent the loss due to operating the electric machinery, nor the loss in transmission to and from the electric machinery. In considering the whole of the losses inseparable from transmission of power by electricity, Professor Reynolds, an able and unbiased authority, concluded that not more than 20 per cent. of the work done by the steam engine could have been applied to any mechanical operation at the other end of the line. Figuring on this basis, which is the best authority now available, we calculate that an electric motor, moving a train under the best conditions, will cost over four dollars for every dollar now needed to operate by steam locomotives.

Experiments on the Oil Pressure in a Bearing.

A PAPER READ BEFORE THE INSTITUTION OF MECHANICAL ENGINEERS.

BY BEAUCHAMP TOWER, OF LONDON.

These experiments were tried with a brass similar to that which had been used for the friction experiments (see Proceedings 1883, pp. 638-9). The bearing was 4 inches diameter and 6 inches long. The brass did not embrace quite one-half the journal, having been reduced till the chord of the arc of contact was 3.9 inches, as shown in Figs. 1 and 2.

* * * * * * *

Three ¼-inch holes were drilled lengthwise in the body of the brass, and through a little more than half its length, Fig. 1. One of them was in the center, and the other two were one on each side of it, Fig. 2. These holes coming out at one end of the brass were connected by converging copper pipes to a Bourdon pressure-gauge. In order to ascertain the pressure at any point between the brass and journal, a hole one-sixteenth inch diameter was drilled from the bearing surface of the brass into one of these longitudinal holes, thus establishing a connection between that point and the pressure-gauge. The pressure having been ascertained, the hole was stopped and another hole drilled, and so on.

The arrangement of the holes which were successively tested was as follows. The brass was supposed to be divided by six vertical planes, three of them parallel to the axis of the journal, and three at right angles to it; and the test holes were situated at the nine points of intersection of these planes. The planes parallel to the axis of the journal were 0.975 inch apart, Fig. 2, so as to divide the brass longitudinally into four parts of equal breadth. Of these three planes, one passed along the axis of the journal, and was called the "center plane." One was on the side where the surface of the journal entered the brass, and was called the "on plane." The other on the side where the journal left the brass was called the "off plane." Of the three transverse planes, Fig. 1, one was in the center of the length of the brass, and was called the "middle plane;" the other two were each one inch apart, and divided the brass from the middle to the end into three transverse slices of one inch length. The plane nearest the middle was called No. 1, and the furthest No. 2. The position of any one of the nine holes can thus be easily described by naming the two planes at the intersection of which it was situated.

The pressure was thus actually read off at nine places in the bearing; but as it is reasonable to suppose that the pressure must be symmetrically disposed on either side of the middle transverse plane, Fig. 1, the pressures were observed on one side only of that plane, and those on the other side were assumed to be the same; so that in reality the pressure may be considered to have been ascertained in fifteen places distributed over the whole bearing surface of the brass.

The bearing had a total load of 8,008 lbs. on it, and the journal rotated at 150 revolutions per minute. The temperature throughout was 90° Fahr. The observed oil pressures were as follows, in pounds per square inch.

Table XII.—Oil Pressure at Different Points of a Bearing.

Longitudinal Planes.....On.	Center.	Off.
Pressure per Square Inch....Lbs.	Lbs.	Lbs.
Transverse Plane, Middle. 370	625	500
" " No. 1.. 355	615	485
" " No. 2.. 310	565	430

Curves drawn by using these figures as ordinates are shown in Figs. 1 and 2 in the accompanying Plate. Their most clearly marked feature is seen to be that the place of greatest pressure is on the "off" side of the center, Fig. 2, the pressure at the holes in the "on" side being in every case considerably less than that at the corresponding holes on the "off" side. The total upward force exerted by these pressures is 7,988 lbs. or within 20 lbs. of the actual load; this very small difference between the load and the oil pressure is probably due to errors of observation.

In order to wear the brass down to a perfect fit on the journal, the bearing was first run for some time with a heavier load than that with which the experiments were taken. It was found that in taking off or putting on weight the pressure fell or rose exactly in proportion to the load. At the end of the experiments the speed of the journal was reduced from 150 revolutions per minute to 20; but the pressure-gauge indicated exactly the same pressure with both speeds.

The oil used was a heavy mineral oil, the journal being about half immersed in it.

EXPERIMENTS ON FRICTION AT A LOW SPEED.

After the completion of the oil-pressure experiments, the speed was reduced to 20 revolutions per minute; and observations of the amount of friction at this speed with various loads were made with the journal running about half immersed in a bath of mineral oil. By this time the brass had become by wear a very perfect fit on the journal: so perfect that, after stopping the journal, the pressure indicated by the pressure-gauge fell very slowly; on one occasion it took about half an hour for the pressure to fall from 600 pounds per square inch to zero. The pressure indicated by the pressure-gauge at 20 revolutions per minute was the same as at 150, thus showing that the brass was as completely oil-borne at the lower speed as it had been at the higher.

The friction was very nearly the same as that obtained in the former experiments with the same kind of oil at 200 revolutions per minute. The following was the observed friction:

Table XIII.—Friction of a Bearing 4" Diameter and 6" Long, Running at 20 Revolutions per Minute in a Bath of Mineral Oil.

Chord of Arc of Contact of Brass, 3.9", Temperature 90° F.

NOMINAL LOAD. Lbs. per sq. inch.	COEFFICIENT OF FRICTION. at 20 revs.=21 feet per min.
443	0 00132
333	0.00168
211	0.00247
89	0.0044

The nominal load per square inch is the total load divided by the product of the diameter and length of the journal; that is to say, it is in this case 1-24th of the total load. It was increased to 676 lbs. per square inch without the slightest signs of heating or seizing.

The action of the American Society of Mechanical Engineers in calling for reform in the Patent Office, appears already to be bearing fruit, for the newspapers all over the country are calling upon Congress to have help enough in the Patent Office to transact business promptly.

Friction Experiments.

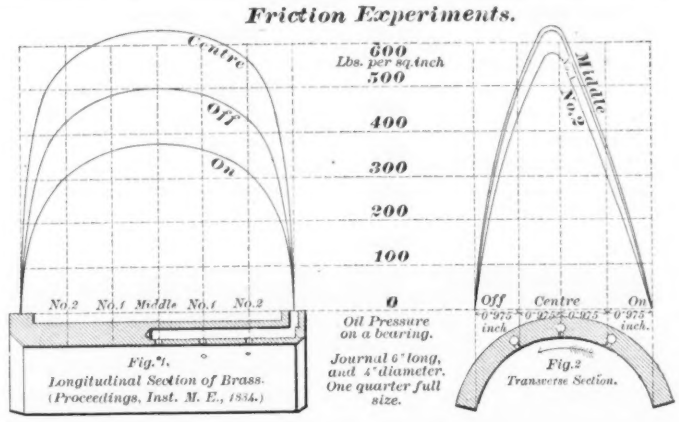
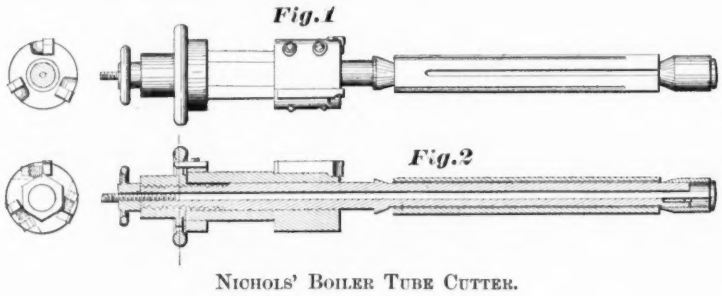
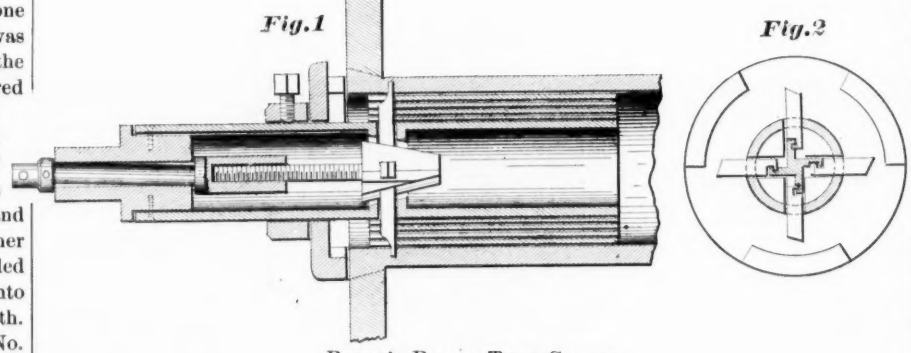


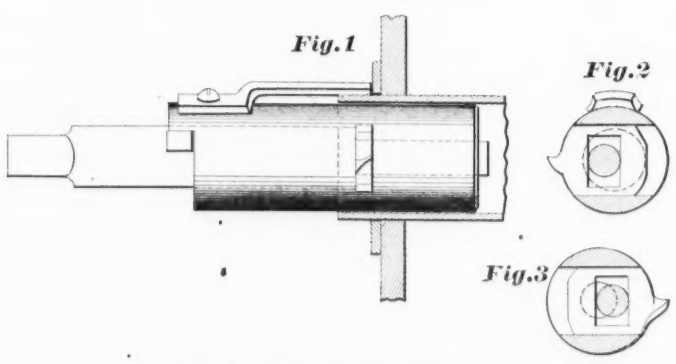
Fig.1 Longitudinal Section of Brass. (Proceedings, Inst. M. E., 1884.)



NICHOLS' BOILER TUBE CUTTER.



BURKE'S BOILER TUBE CUTTER.



WRIGHT'S BOILER TUBE CUTTER.

Expiring Boiler Tube Cutter Patents.

BY F. B. BROCK, WASHINGTON, D. C.

The patents relating to boiler tube cutters which have expired exhibit a surprising completeness in their design and adaptability for the purpose intended.

It should be borne in mind that these devices are public property, and, as such, are free to be appropriated by any one.

In tools for cutting off boiler tubes to their required length, after they have been put into the boiler, several have been devised. Some of these tools gradually shave or pare away the end of the tube; others employ a gauge to determine the distance at which the tube should be cut, a mandrel to fit the tube, and also a cutter arranged to act within the tube, and adjustable from the outside of the tool, so as to groove the tube in a series of rotations, which finally sever it.

The device of Nathan Wright, of Jersey City, brings into play a direct shearing action of the cutter from the inside of the tube, whereby the motion of the tool projects the cutter through the tube, and continues the shearing cut all round the tube until it is cut. The device is said to give a clean, finished and expeditious cut.

The mandrel is hollow, to receive longitudinally within it (so as to be capable of turning) the operating rod or shaft, which projects through the outside end of the mandrel. This actuating shaft is made with a cam for the purpose of projecting beyond, or drawing within the periphery of the mandrel, a shear-edged cutter, upon the rotation of the shaft. This advancement and recedure of the shear edge is clearly shown in the two detailed sectional views. The cutter is fitted within a slot cut transversely through the mandrel, and the body of the shear has also a slot into which the cam works to project or draw in the cutter.

More or less "shear" may be given to the cutter, according to the metal operated on. The shaft is provided with a driver stud, which strikes against an offset on the mandrel. The mandrel has also a gauge, as shown.

The drawings show the cutter applied to a tube fixed in a tube sheet.

The projection of the cutter through the tube is effected by a thrusting cut, and the shaft, mandrel and cutter are carried round together, the cutter projecting into the tube, and shearing the latter all round as the mandrel is turned.

The tool devised by Richard H. Burke, of Greenpoint, N. Y., is intended to cut off boiler tubes inside the tube sheet, but may also be used for cutting off the ends of such tubes. The engravings represent a longitudinal and a transverse sectional view of the Burke device. The patent expired during the present year.

The invention comprises a wrought-iron pipe, having a head at one end, and provided with a square projection upon which the wrench is fitted when operating the device. Through this head passes the sleeve of a tubular nut, which receives the screw shank of the cutter head. From this cutter head extend radial cutters, which are connected to the head by means of lips, which catch in suitable guide grooves in the head, as shown in the transverse view. These guide grooves extend throughout the entire length of the head, and impart to it a longitudinal motion, by means of which the radial cutters are fed out or drawn in, as the case may be.

The wrought-iron pipe or mandrel, before referred to, extends inwardly beyond the cutter head, and is made of such a diameter that it will fit in the tube to be cut. In order to adapt this pipe to tubes of different sizes, a series of sleeves are fitted on, the outside diameters of which correspond to different-sized tubes. This enables the same tool to be used for cutting tubes of five or more sizes.

In operating this tool, the mandrel is guided by a cap, which is held up against the outer surface of the tube sheet by a ring secured in place by a set screw. The cutters are fed out by turning the stem and its nut in-

dependent of the mandrel. When the points of the cutters strike the inner circumference of the tube to be cut, the mandrel is turned and the cutters begin to cut into the tube. As this operation progresses, the cutters are gradually fed out by turning the stem or shank with which the screw adjustment is connected.

David M. Nichols, of New York City, in 1866 constructed a cutting tool comprising a bar, or shaft, with a hole bored through its center to receive a tightening screw, and having a stationary and shifting cone. An expanding sleeve is combined with this device in such a manner that the tightening screw on the shifting cone expands both ends of the sleeve. The cutters are secured in the head, which is keyed on the shaft. The engravings include both an elevation and sectional view of the Nichols device, together with transverse detailed views.

The main shaft of the tool is hollow, and is made to receive a screw, extending through it, provided with a head at one end and a nut at the other.

This shaft is provided with a stationary cone about mid-length, and a shifting cone at its end. Situated between these two cones is an expanding sleeve, which is slotted as shown. The cones are made to approach each other and expand the sleeve by means of the adjusting nut at the outer end of the tool. It also acts to center the device within the tube.

The cutters are secured in the cutter head, which is firmly keyed to the shaft. This head is provided with a true face, beyond which the cutting edges are made to project just sufficiently to cut the desired depth.

The devices which have been described are all arranged to cut the tube from the inside, and are designed solely for the cutting of tube-heads.

The Coatesville Steam Crane.

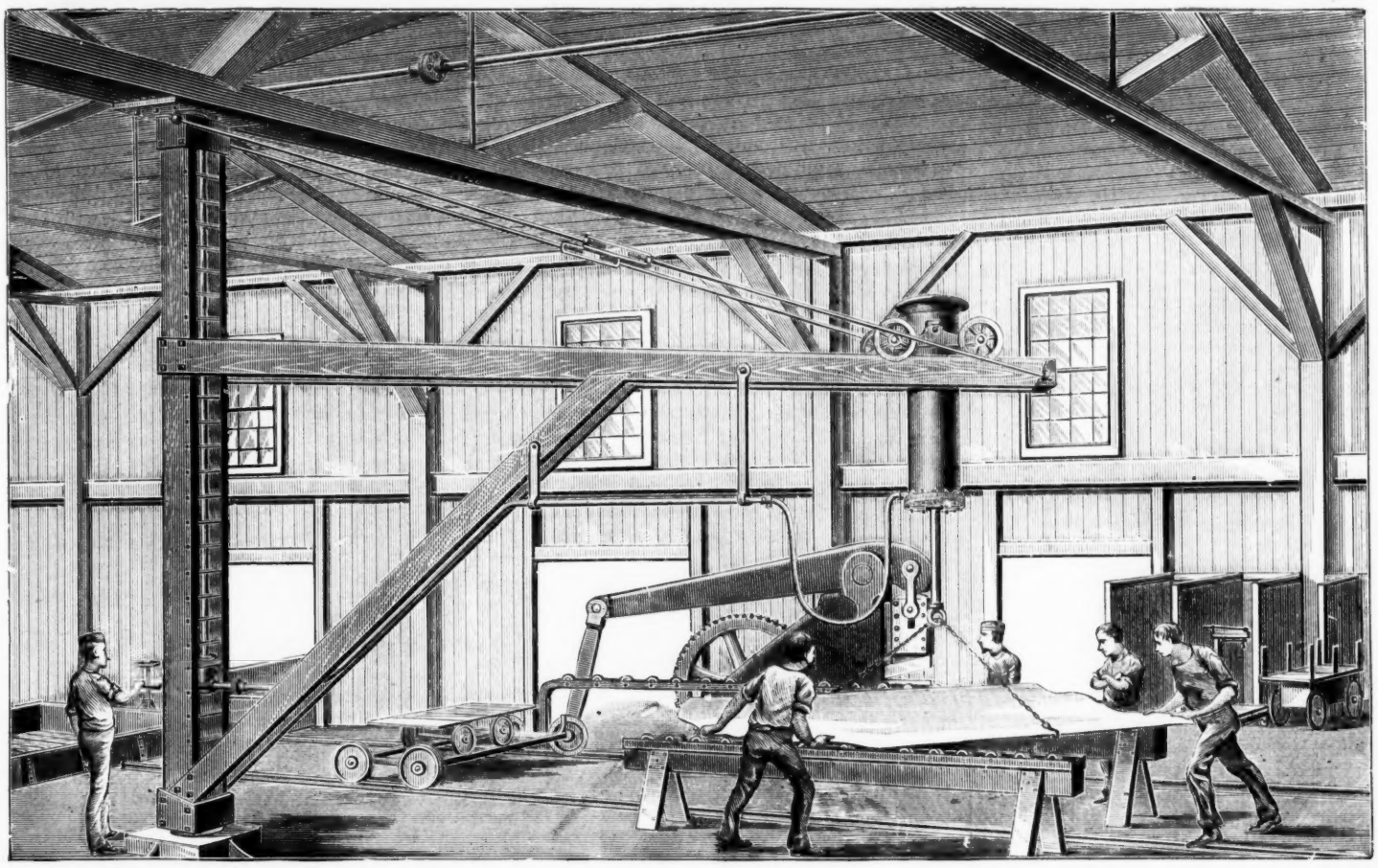
The engravings represent two adaptations of this crane. In both the lifting power is obtained through a cylinder adapted to be traveled in and out on the crane jib. In the rolling mill crane live steam is taken through the top gudgeon, an iron pipe leading to about midway of the jibs, from which a flexible pipe connects with the bottom of cylinder. The exhaust is led out through the bottom gudgeon. To operate, steam is admitted under the piston, raising it and the attached weight. Holding the weight in position by the steam pressure under the piston, the jib can be swung around, or the weight be run out or in to any desired position, and lowered by opening the exhaust.

The maximum weight a crane of this kind will handle will, of course, depend upon the size of the cylinder and upon the steam pressure. The cylinders are made of a diameter to suit the other conditions and requirements.

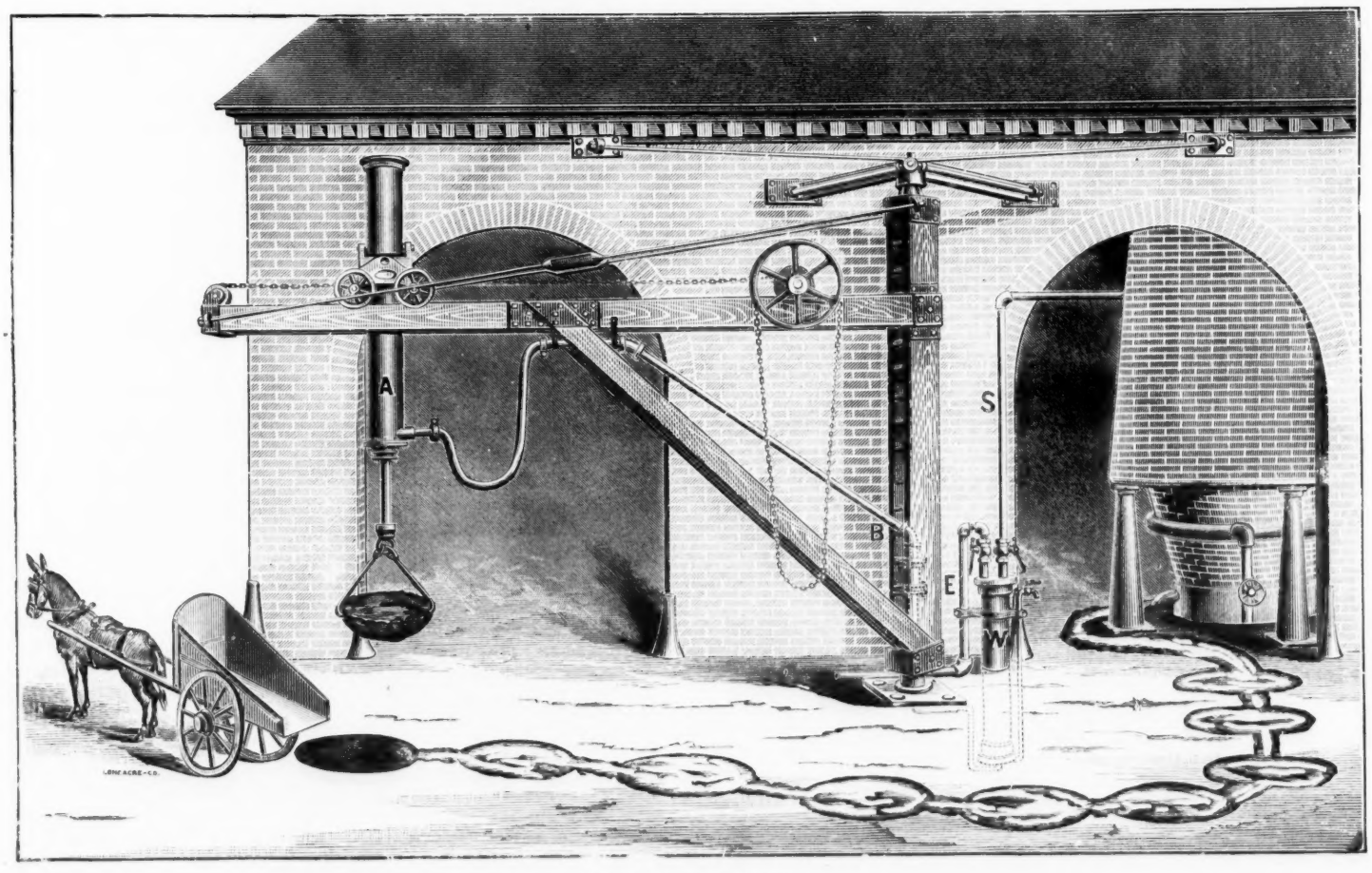
In the blast furnace crane the cylinder *A*, and with it the attached weight, is traversed on the jib by means of the wheels and chains shown. Instead of using steam in the cylinder *A*, it is converted into an hydraulic crane, as follows: Near the post of the crane the cylinder *W* is placed. The capacity of this cylinder is a little in excess of that of the cylinder *A*. From the bottom of the cylinder *W* a pipe leads up through the bottom crane gudgeon and stuffing-box *B* to cylinder *A*. The steam pipe *S* is attached to the top of cylinder *W*. *E* is the waste exhaust pipe, to be used as described further on. The cylinder *W* is filled with water. To operate, the exhaust valve is closed and the valve on steam pipe is opened. This admits steam on top of the water, which forces the water into the cylinder *A*, raising piston and weight. To lower the weight, the steam valve is closed and the exhaust opened, the water flowing back into *W*, to be used over again. If it becomes necessary to change the water, a valve is opened, which permits it to flow out upon the ground through pipe *E*.

It is claimed that after first starting the condensation of steam in cylinder *W* is no greater than that in an ordinary engine doing the same work, while the use of pumps, accumulators, etc., is dispensed with. The speed at which this crane will work is governed by the size of the connection between the two cylinders; hence, no injury can result from careless handling, or from the weight becoming detached.

These, and various other adaptations of this crane, are made by Craig Ridgway & Son, Coatesville, Pa.



ROLLING MILL CRANE.



BLAST FURNACE CRANE.

"With a view to encourage the invention of machines for reaping and harvesting," the Government of Victoria, Australia, has offered the munificent sum of £250, or $1,250, for an invention that shall be an improvement on machinery at present in use in the colony. The Australian legislators must have very brilliant ideas about the value of inventions if they suppose $1,250 will pay for any substantial improvement upon the reaping and mowing machines now being sold from the United States to all parts of the world. They should search the history of inventions in harvesting machinery, and after learning something about the time and money expended in devising and developing new styles of mowing and reaping machines, they will probably come to the conclusion that it is useless to even mention $1,250 as a reward for any real improvement on that class of machinery.

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NEW YORK, DECEMBER 13, 1884.

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The Mechanic's Opportunities.

The average working American machinist does not expect to spend his whole life at the vise-bench or at the lathe. Working at the trade gives him, and, perhaps, his family, a respectable livelihood, but he expects that the skill and knowledge gained by steady application will be the means eventually of raising his condition above that of the ordinary artisan. The ambitious dreams of various men take different flights. One anticipates rising through the grades of foreman and superintendent to the pinnacle of contentment; another means sometime in the undefined future to go working for himself, when by energy and ability he will build up a business and make his mark in the mechanical world. As sentiments akin to these are cherished by a large proportion of the younger men in our workshops, it is not necessary to write words stimulating their ambition or urging them to strive and work upwards: but it may, perhaps, prove seasonable to mention some of the ways and means that can best be used to accomplish the desired ends.

The first aim of a mechanic ought to be to learn his trade properly, to become thoroughly master of his business in the shop. That is the foundation on which his first claim to preferment should rest, but if it continues to be the only claim the chances are that he will fall behind; for in these days knowledge that must be gained out of the shop is, in nearly all cases, requisite to adapt a mechanic to successfully direct other men's work. There is no tendency around our shops to undervalue mpnual skill. The man who can take a bold cut and push it through with decision, then with a second cut finish with prompt accuracy, will always have admirers among shopmates and employers; but the capability of making a lathe do its best work on a crankshaft is, in certain cases, really of less value than being able to calculate what strain the shaft will safely bear in actual service. A machinist may fit up the valve motion of an engine with unexcelled accuracy, but his insight into the business is superficial if he knows nothing about the principles on which the motion is designed, yet these one-sided mechanics are legion. A good pattern-maker is one of the most useful and helpful workmen connected with a machine shop, but the training of this pattern-maker seems unfinished when he cannot tell how fast the fly-wheel can safely be run for which he has just turned out an excellent pattern. Boiler-makers perform very important mechanical work, on the character of which life and property are very often dependent, but a boiler-maker has certainly a very contracted acquaintance with his trade if it is confined entirely to riveting, caulking and other work of fastening sheets together so that they will not leak under ordinary pressure. Ability to calculate the pressure that a boiler can safely stand, how much safety valve capacity is necessary for a boiler of certain dimensions, and some acquaintance with the strength of sheets appear to belong to the trade.

The lathesman, the vise hand, the pattern-maker and the boiler-maker are just as capable of doing their routine work without having the theoretical knowledge referred to, but if an employer wishes to raise either of these men to a higher position in the shop the want of this knowledge must be a serious obstacle in their way of promotion. Should either of these men start out to work for himself, he will have to obtain an insight into the principles that underlie the mechanical operations of his work, or it will be carried on at great disadvantage.

Of late years much has been done in giving young men excellent scientific training in technical schools, and the expectation has been raised that graduates from these schools would, to a great extent, fill the places of trust and responsibility within our engineering establishments; but if men with this training push mechanics aside, the mechanics themselves are to blame for not opposing the innovation by keeping themselves the more valuable of the two classes. If a machinist possesses a fair acquaintance with drawing, is proficient enough at figures to perform ordinary mechanical calculations, and has studied the elements of mechanical science, he is in a far better position to advance in his business than a technical school graduate who has not received the advantage of a proper shop training. Without passing through the experience of doing all kinds of shop work, a man is seldom competent to supervise the operations of a shop; and few employers care to employ as a foreman a man who is not able to tell exactly how long each workman ought to be in doing any job he may be called upon to perform. An experienced mechanic also has a great advantage in scheming out arrangements about tools, and in devising methods of facilitating work that greatly enhance his value when directing the work of others. For this reason, when other recommendations are equal, the mechanic will continue to be selected as foreman, and the foreman is in the direct line of promotion for superintendent or master mechanic.

When we survey the great industrial army that has passed before the world's eyes during the last century achieving such glorious victories in peaceful art, we find that the leaders were not born amidst rulers, but were men raised from lowly degree by their own perseverance, energy, and industry. The opportunities that past leaders of industry embraced, will again come around to the men of this generation who are ready and worthy.

Decline of the Apprentice System.

Every few weeks we find in some trade paper with aristocratic sympathies a chapter of lamentations on the decline of the apprentice system. There never was an apprentice system in America of the character known to the old guilds, where the trade masters in Europe imitated the feudal military practices by grasping their subordinates with an iron hand; but there has been no difficulty in training youths to do work of skill, which is really the end wanted. With all its looseness of organization and habits of personal freedom, the practice of the American shop turns out excellent workmen, whose productions compare favorably with the best work of any nation. In the mechanical trades particularly there are very good opportunities for youths desiring to learn a trade to learn it thoroughly, although in some branches the practice of sub-dividing labor has tended to confine men to single operations. That there is no lack of skill is apparent to any one who has the means of seeing the excellent output of our workshops. So long as the high standard of skill is maintained, it matters little in what way it is attained.

Depression in manufacturing business has caused the discharge of a great many workmen, and the cutting down of the wages of those retained, in many cases ten per cent. There has been, as yet, no cutting down of the wages of office-holders. A reduction in this direction is desirable. Let Congress take the matter in hand, order the discharge of all officials not actually needed, and cut the salaries of those retained ten per cent. all around, beginning with the President. There is no good reason why office-holders should not share in reductions caused by general business depression.

Another Marine Boiler Mystery.

On November 20 the tugboat James McMahon, of New York, was engaged in towing some barges from Stamford, Conn., to Jersey City, when, without any warning, the bottom of the boiler blew out, tearing a rent through the craft, sending the boat to the bottom of the Sound. Three men lost their lives by the occurrence. The engineer, who escaped, on being questioned about the affair, said that when the explosion occurred the boat was working along at its usual speed. Just before the accident he looked at the steam gauge, which indicated the maximum pressure of 50 pounds to the square inch, and he was sure there was plenty of water in the boiler. The cause of the explosion was a profound mystery to him. All and sundry connected with the boat, directly and indidirectly, are now speaking of the fatal explosion as an "inexplicable mystery." There seems to be something intensely attractive about the nourishing of mysteries connected with boiler explosions, to judge by the ready way their presence is discovered. Should this tug ever be fished from the bottom of the Sound, where she is now lying, we confidently predict that the mystery of the explosion will be dispelled by the discovery that the boiler sheets were corroded till they had not strength left to resist the working pressure of 50 pounds to the square inch. This was the kind of mystery that sent the Riverdale to the bottom of the Hudson River a year ago, and it is the mystery that leads to destruction the lion's share of the boilers that explode.

Relative Energy of Coal and Corn.

The utilization of the heat energy of coal to produce motive power has performed such wonderfully valuable work for civilization in the last century that there is a disposition among us to over-estimate the value of coal in the world's economy. Taking one pound of coal at a theoretical evaporative power of 15,000 thermal units, and each unit as equivalent to 772 foot-pounds, we have 11,580,000 foot-pounds for each pound of coal, but of this the best form of steam engine only utilizes about one million foot-pounds. Discoursing on this subject, Professor Reynolds says: "It must not be forgotten that, after all, the most important source of energy is not coal, but corn and vegetable matter. The power developed in the labor of animals exceeds the power derived from all other sources, including coal, in the ratio of probably 20 or 30 to 1; so that, after all, if we could find the means of employing such power for the purposes for which coal is specially employed—such as driving our ships and working our locomotives—an increase of 10 per cent. in the agricultural yield of the earth would supply the place of all the coal burned in engines. The energy which may be derived from the oxidation of corn has yet only been artificially developed in the form of heat, and this may be the only possible way, but physiology has not yet advanced to the point of explaining the physical process of the development of energy consequent on the oxidization of the blood; and it is, at all events, an open question whether the energy of corn may not be really a form of directed energy, in which case corn would yield six or eight times as much energy as coal does at present consumed in our engines. As consumed in animals, it yields a larger proportion of energy, two or three times as much, and may be more. Should we find an artificial means of developing anything like the full directable power of corn—a problem which has not yet been attempted—coal would no longer be necessary for power. Beside wind and water, there are other and as yet untried directions from which mechanical energy may be derived in the future.

There is a boom going on all over the country in reducing wages, but after inquiries in several large cities where the downward tendency of wage earners' income is most decided we cannot discover that prices of the necessaries of life decrease any. House rent maintains the extravagant altitude it attained during the prosperous years of 1881-2, and butcher meat and other articles of food indicate no downward tendency. Altogether, the downward boom is too one-sided.

The Fort Worth (Tex.) *Gazette*, which is bitterly opposed to protection, says:

"We need more Bill Morrisons. It is our misfortune that we have not got them. It is not for lack of ability, for there are more able men in Congress than Morrison, but it is lack of courage. They fear manufacturers' gold."

This indicates the free trade idea of American manufacturers. They are represented in free trade organs as a class of

men to be shunned and hated, and opposed in every effort to extend productive industries. By the force and influence of gold they are depicted as intimidating members of Congress who desire Morrisonial reduction of the tariff. Free trade newspapers belong to an ancient era, and for some of them there are small hopes of ever catching up to the times.

Peculiar Smoke Box Equipment.

R. W. Bushnell, master mechanic of the Burlington, Cedar Rapids and Northern Railway, is using a peculiar spark-arresting arrangement in connection with the extended front end. He has an exhaust pipe ending in a single nozzle, that extends up about the middle of the flue sheet. From the top of the nozzle to the base of the stack a pipe similar to a petticoat pipe without the flare extends, and this pipe is perforated with small oblong holes, about half the sheet being cut out with these holes. The netting is fastened in the ordinary position for extended front ends, but no diaphragm plate is used or is found necessary, as the perforated pipe acts as a draft regulator. Indicator diagrams taken from a locomotive thus equipped are remarkable for the absence of back pressure.

The locomotive boiler, illustrated and described on page 4 of this issue, is an interesting contribution in the attempt to increase the efficiency of the locomotive boiler. This boiler has been designed by Mr. A. J. Stevens, general master mechanic of the Central Pacific Railroad, whose inventive genius has made a prominent mark on the American locomotive. Boilers of this kind, in heavy service, are giving very high evaporative results that ought to encourage others to give the type a trial.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(471) **T. M., Lowell, Mass., asks:** Can I get more power from a long than from a short screw driver? *A.*—See answer to question 452, Nov. 22, 1884.

(472) **L., Providence, R. I., will find** information on determining the diameters of cone pulleys in the AMERICAN MACHINIST of Oct. 15 and 22, and Nov. 26, 1881.

(473) **X., Tucson, A. T., asks:** What should be the diameter of the bell of a whistle, as compared with the diameter of the annular steam opening? *A.*—It may be the same diameter as the annular steam opening.

(474) **J. M. F., Wilkesbarre, Pa., asks:** How can I make a cheap filter to filter rain water before it enters hogsheads? *A.*—Fill a barrel one-third full of clean sand, on this powdered charcoal up to, say two-thirds full, on this coarse gravel. Let the water pass through this before it enters the hogsheads.

(475) **G. M. L., Cincinnati, Ohio, asks:** What is a good paste to stick labels to tin, and is it advisable to scratch the tin? *A.*—It is said that the addition of a small amount of glycerine to common stationer's mucilage—one or two drops to a small bottle—makes a good paste for this purpose. We do not think it advisable to scratch the tin.

(476) **T. E., New York, writes:** 1. I am going to build a small boat, 50 feet long and 10 feet beam. What size engine and boiler should I use to get a speed of about 10 miles per hour. *A.*—To insure this speed we should say you would require an engine 10″x10″; boiler 60″ diameter, 8 feet high 2. In what year was the Hell Gate explosion? *A.*—1876.

(477) **J. S., Bergen Point, N. J., writes:** I am working with a hydraulic press, and have trouble with the leather packing. Is there no better way to pack the press, and is there any one who makes leather packing of U-form? *A.*—We do not know of anything better than leather for packing the press. You will find directions for making the U-shaped packing in the AMERICAN MACHINIST of August 20, 1881. It can be made in any machine shop. With that kind of packing you should have no trouble.

(478) **J. M., Burton, Vt., writes:** I have a boiler 18″ diameter and 39″ high; fire-box, 14x14; 28 tubes 1½″ diameter. 1. Would an engine 2½″ or 3″ bore be most suitable to use in a boat with such a boiler? *A.*—We think a 2½″ bore will use all the steam the boiler will make comfortably. 2. What size boat? *A.*—Boat 18 or 20 feet long, 4½ feet beam. 3. What size screw? *A.*—Screw about 20″ diameter, 24″ pitch. 4. The boiler is made of ¼″ iron. What would be a safe pressure? *A.*—If well made the boiler should be safe at 150 pounds pressure.

(479) **W. A. H., Lowell, Mass., asks:** 1. How can I figure the theoretical water consumption from diagrams from compound engines? *A.*—Figure from diagrams from high-pressure cylinder just as if no low-pressure cylinder were in use. 2. If you have two diagrams of equal length, taken from the same engine with the same indicator, the load being the same, but in one instance the reducing motion being practically correct, and in the other instance incorrect, will they measure alike by the planimeter? *A.*—No. The planimeter will not correct mistakes made in taking diagrams

(480) **A. W., Providence, R. I., writes:** I have a formula for finding the safe working pressure of a boiler, which is as follows:

P—T×C÷D; in which P=bursting stress, D=diameter of shell, C=constant 1097 for single-riveted and 1372 for double-riveting. What is T? Will you express this in common English? *A.*—T evidently =thickness of shell in inches. We should put the formula into the following rule: Multiply the thickness of shell in inches by the constant, and divide the product by the diameter of the shell in feet. Example: What would be a safe working pressure (by this formula), for a boiler 4½ feet diameter, made from ¼″ (.25″) plate, single-riveted? 1097×.25=274.25, and 274.25÷4.5=60 lbs. per square inch. This would be about the pressure allowed by U. S. inspection laws for iron of 40,000 pounds, tensile strength.

(481) **Clearance, Jersey City, N. J., asks:** Should an engine cylinder be counterbored so the packing ring, or only the follower, will run over the shoulder, and how much should either run over in cylinders the size of those of ordinary locomotive cylinders? *A.*—One of the ends aimed at in counterboring engine cylinders is to prevent wearing a shoulder, against which the packing may strike when the length of rod is slightly changed in lining up, hence the packing should travel over the shoulder. From ⅛″ to ¼″ is the distance the packing is usually allowed to travel past the shoulder; in some instances more. The distance should be determined to some extent by the kind of packing used, and the amount of the clearance between the piston and the cylinder head. With narrow packing, if the cylinder is counterbored in too far, there is danger that, as the length of the rod changes, in keying up, the ring will drop into the counterbore. The counterbore should never be so deep but that the piston will strike the head before this can occur.

(482) **E. S., Hoboken, N. J., writes:** 1. In cutting chasers with hobs 1½″ diameter, 16 to 32 threads, when the chaser is nearly finished the hob tears the top of the thread. The grooves in the hobs are cut only to the bottom of the threads. How should the hobs be made? *A.*—We should infer, from what you write, that the principal trouble was in not cutting the grooves deep enough. It is not necessary to cut the grooves as deep as for a tap, but they should be cut deep enough to clear a light chip, otherwise they will be likely to tear the top of thread. We should, in a hob of the size and for the pitches named, have not less than ten grooves. 2. How can I turn babbitt mandrels smooth, and how polish them? They are for syringes, and must be extra smooth. *A.*—There is no difficulty in cutting babbitt metal smooth with almost any sharp lathe tool. In finishing use a flat-ended tool, touched up with an oil stone. You can polish with crocus cloth, but it will be better if you turn so smooth as to require no polishing. The polishing material is apt to stick in the babbitt.

(483) **F. S. R., ———, Pa., asks:** Will you tell me the proper place to put a back pressure valve in exhaust pipe when using exhaust steam for heating purposes; also its utility? I have to put in 800 feet of 4″ heating pipe direct from engine, and want to know where to put back pressure valves. *A.*—A back pressure valve is used for either or both of two purposes; to hold a little back pressure—generally about two pounds—in heating pipe, and to prevent excessive back pressure on the piston of engine. Where it should be placed, or whether one is necessary at all, depends upon the arrangement of heating pipe. If the arrangement is such that by shutting off from coils, or for any other reason, the free escape of exhaust steam will be prevented, then a back pressure valve in the exhaust pipe anywhere near the engine, arranged so that if the pressure in the exhaust pipe exceeds a limit of, say, two pounds, the valve will lift and permit the steam to escape through a branch pipe, will accomplish the purpose. In some cases where the heating is done by a direct continuance of the exhaust pipe, the back pressure valve may be placed at the end of the pipe, that is where the steam finally escapes to the atmosphere. In cases where the exhaust is used for heating on different floors, the exhaust pipe (large size) should pass direct to the roof, the heat being taken off by branches, and a back pressure valve may be placed at or near the outlet. Bearing in mind the objects of the back pressure valve, your judgment will tell you where it will best accomplish them.

Business Specials

Transient Advertisements, 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Mackenzie Cupolas and Blowers, 245 B'dway, N. Y.

Presses & Dies, Ferracute Mach. Co., Bridgeton, N. J.

Steel Figs per set $1.00. S. M. York, Cleveland, O.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John street, N. Y.

Herbert W. T. Jenner, Mechanical Engineer and Solicitor of Patents, 632 F st., Washington, D. C.

Power Measured—F. Van Winkle, mechanical engineer, 22 Cortlandt street, New York.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Pattern and Brand Letters, Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York

Universal grinders for lathe-centers, chucks, angles, or cylinders. C. C. Hill, 84 Market st., Chicago, Ill

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

The Straight-Line Engine Company, Syracuse, N. Y., will send their new catalogue on application.

Mech'l drawing and machine designing, work requiring skill and experience solicited. Reasonable rates. Corresp'nce invited. Weston & Smith, Syracuse, N. Y.

DRAWINGS — Mechanical, electrical and Patent Office. All styles of artistic designing. Special facilities. Low rates. Wallace Metcalf, 140 Nassau St., N. Y.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Split Pulleys at low prices, and of same strength and Appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

The "Wax Process" Engravings shown in the AMERICAN MACHINIST each week are made by Struthers, Servoss & Co., 32 Frankfort Street, N. Y.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large: prices low. Frasse & Co., 62 Chatham St., N. Y.

Farley's Reference Directory of the Machinists, Iron, Steel, and Metal-Working trades of the United States. A. C. Farley & Co., Philadelphia, Pa.

Improved Tack Machinery, made by The Willets Man'f'g Co., can be seen in operation at their works, 57 Clifford St., Providence, R. I.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant, $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

Locomotive Engine Running. By Angus Sinclair. Price, $2. A handsome, interesting book. Just the thing for a holiday gift. Published by John Wiley & Sons, 15 Astor Place, N. Y.

EXTRACTS FROM CHORDAL'S LETTERS, 400 pages, 12mo., handsomely bound in cloth. New and enlarged edition, with over 50 illustrations. Price $2. Published by John Wiley & Sons, 15 Astor place, New York.

Manufactures.

The Lansing, Mich., Iron Works are erecting a 30x60 brick addition to their building.

The Novelty Iron Bridge Works, capital $5,000 has been incorporated at Dallas, Texas.

It is reported that the East Tennessee, Virginia & Georgia Railroad will erect car works at Atlanta, Georgia.

Blaine Bros., previously reported as having decided to build a car factory at Ellaville, Fla., are now at work on it.

The East Tennessee, Virginia & Georgia Railroad has commenced the erection of a very large round-house at Rome, Ga.

The Chicago Hardware Manufacturing Company are again increasing their capacity by the addition of new machinery.

The Beaumont Iron Works, Beaumont, Texas, will in the spring erect a foundry for casting cooking and heating stoves.

George McCauley has purchased an interest in the Brunswick Foundry, Brunswick, Ga., and will make extensive improvements.

The Railway Barb Fencing Company, Cleveland, are erecting a new brick wire mill, which will double their productive capacity of tinned wire.

The Manhattan Hardware Company, Reading, Pa., are now adding to their capacity by building a new foundry, machine shop, packing-house, japan house and office.

The Warren Featherbone Factory, at Three Oaks, Mich., which manufactures a substitute for whalebone out of feathers, has shut down in order to extend its capacity.

The Hall Engineering Company, 112 John Street, have just received a stock order for several dozen injectors from a large Western house. They report business improving.

Collums' Detersive Fluid is an article used largely by leading railroads for cleaning paint and varnished work. Geo. T. Nock, 176 Fulton Street, New York, is the manufacturer's agent.

The Foos Manufacturing Company, Springfield, Ohio, are behind orders. They are now building an extensive addition to their factory, and are running their works until 9 o'clock at night.

The Mississippi Valley Railroad have selected ground in New Orleans on which to erect repair machinery shops. Mr. E. D. Anderson, the master mechanic of the road, has charge of the work.

The Singer Sewing Machine Works, in Elizabethport, N. J., have discharged 600 of their employes, and propose to discharge 500 more. The working hours have been reduced to forty-two hours a week.

Benjamin Franklin left $5,000 to Boston, to be loaned in small sums to young married mechanics under twenty-five. The fund now amounts to more than $290,000, and is increasing at the rate of $10,000 a year.

The Case Manufacturing Company, Columbus, O., will erect a large new factory during the season, and will put in all necessary wood-working and iron-working machinery to make it a model establishment of its kind.

The Newaygo (Mich.) Manufacturing Company has just been organized with a capital of $500,000, of which $400,000 is paid-up stock. D. P. Clay, of Grand Rapids, is the principal stockholder and president, and Mr. A. J. Daniels, vice-president.

Lake City Tool Company, Madison, Wis., manufacturers of duplex geared windmills, pumping mills, feed grinders, etc., are erecting a foundry, 40x60 feet, a new warehouse and paint shop. They are also putting in some new special machinery.

An agricultural implement works is soon to be established at Birmingham, Ala. Its capital stock will be $50,000, divided into $100 shares. The concern will be known as the Birmingham Agricultural Works, and Dr. T. Marable will be superintendent.

There is some talk of forming a company in Augusta, Me., for the operation of a wire mill in the vacant building erected recently at the east end of the railroad bridge. It is proposed to use the machinery of the Hallowell wire mill, which would be transferred to Augusta.

The Diamond Wrench Company, Portland, Me., are now forging their improved steel wrenches at the rate of thirty-five dozen per day, and will soon have increased capacity which will enable them to turn out fifty dozen per day. The company will make a handsome exhibit at New Orleans.

The Ames Sword Company, Chicopee, Mass., are hard at work on a large order for sabers for the Chinese Government. They are employing more hands than ever before since the company was incorporated, and have promise of enough work from the Chinese Government to keep them busy some months.

The Chesapeake & Nashville Railroad Company, of Nashville, Tenn., are busy surveying for their line and making preparations to build. The site for the large bridge over the Cumberland River, to which the county will contribute $100,000, has been selected. It is understood that the machine shops of the road will be located at Nashville.

Hardie & Collins have recently started a machine and boiler shop at 56 South Fifth Street, Brooklyn, E. D., N. Y. They are both practical engineers and machinists. Mr. Hardie was for many years a member of the firm of John Robertson & Company, of that city. They have taken an order for two fire engine boilers for the Brooklyn Fire Department.

Benjamin Eastwood, manufacturer of silk machinery, laundry machinery, etc., Paterson, N. J., writes us: "Trade with us is (as it has been all along) quite brisk. We have been enabled to keep our full force of men at work, and run full time. While trade is generally rather dull, it bids fair to become more brisk, and I think we shall have a busy spring.

We have made great advancement in our laundry and silk machinery, and are fully equipped for doing all kinds of machine work and to furnish castings to others.

The *Manufacturer's Gazette* says: "The Commissioners of Prisons and Col. Tufts, who is to be the superintendent of the Massachusetts Reformatory, soon to be established at Concord, have decided not to let the prisoners on the contract system at a price per diem, but to manufacture goods for outside parties on the piecework plan. Under this system the party for whom the goods are made furnishes the materials and pays a designated price for manufacturing them, having no control of the prisoners in their work. The commissioners are ready to confer with manufacturers who desire to consider the question of having goods manufactured in this way."

President E. D. Shelton, of the Shelton Tack Company, Birmingham, says that the great tack nail-making monopoly is now nearly broken. The combination must burst very soon and all go into the market on an equal footing. At present there is a large tack factory building in Cleveland, Ohio, which is in the center of the Western trade of this combination. This does not look encouraging. Business is dull in the tack trade. Mr. Shelton says that the cause is overproduction, there being three times too much machinery; and finally he attributes much of the dullness to the combination of tack-making concerns that for years foolishly spent money purchasing small manufactories for the purpose of controlling the market.

The city authorities of Columbia, Tenn., have exempted the Columbia Cotton Factory and its stock from all taxes for twenty-five years. This company, which has been incorporated with a capital stock of $100,000 and a bonded indebtedness of $75,000, is erecting a large factory at Columbia, which is rapidly approaching completion.

The Boston *Commercial Bulletin* says: "D. S. Jenkins, of Brockton, Mass., the largest manufacturer of tacks, brads and similar articles, who is *not* connected with the Tack Manufacturers Association, makes an announcement which will be of interest to dealers and jobbers in that trade. His concern being unchecked by association prices, is offering its goods at an actual 50 per cent. discount from the hardware list, as adopted by the Tack Manufacturers on October 1, 1884. Mr. Jenkins is capable of attending in a satisfactory manner to the demands of a large trade."

Machinists' Supplies and Iron.

NEW YORK, November 27, 1884.

No new feature has developed in the supply trade since last week. In two places visited to-day in search of information regarding the outlook we were answered by a gesture indicating a flat surface. Flat is the key-note sounded all around.

Boiler maker and steam supplies are in about the same condition as machinist supplies.

Iron—The condition of the pig iron market continues about the same as it has been so long. Buyers continue hanging off as long as possible in hopes of obtaining concessions on the low prices that already prevail, and in many instances they succeed in obtaining supplies below the quoted figures. The stock of iron on hand is extremely low for the reason that dealers will not take in more stock than their immediate needs call for, expecting that still lower prices will prevail. Standard Lehigh Valley brands keep quotations unbroken, but it is understood that sales have been made at a decline, and all other brands are nominal. We quote No. 1 X. Foundry at tidewater, $19 to $20; No. 2 X. $18 to $18.50; Grey Forge, $15.50 to $16.

Scotch Pig—In this market the demand is light and prices depressed. We quote Shotts, $21.50 to $21.75, to arrive; Coltness, $22, to arrive, and $22.50 from yard; Glengarnock, $22.50 to arrive, $21.50 yard; Langloan, $21; Dalmellington, $19.50.

Antimony—Regulus has been in moderate jobbing request at about steady prices. We quote Hallett's brand 10 to 10¼ cents, and Cookson's 10¼.

Copper—There have been but few buyers of Ingot, and the business in progress has not exceeded retail proportions. Dealers ask 12¾ cents for Lake, and in a small way obtain this price, but it would be difficult to obtain a bid of 12½ cents for a round lot. Baltimore has sold at 11¼ in a small way, and other brands are not quoted above 12 cents.

Lead—The marked for Common Pig has again ruled dull, but without quotable change. There has been very little demand or even disposition to buy, the only fresh business comprising car lots at 3¾ @ 3.40 cents and 100 tons at 3.35. The offerings are liberal and buyers could readily supply their wants at above figures, according to quantity.

Tin—The market has been almost at a stand during past three days, no business of importance having transpired and values being without quotable change. Dealers and consumers do not appear to require fresh supplies and there has been an entire absence of speculation. Sellers have asked 16¾ @ 16¾ cents for large lots, 16.90 cash, and 70 thirty days in a jobbing way, but buyers have been scarce.

✻WANTED✻

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

An experienced mechanical draftsman, 2 years in his last place, wants a situation. Address "Shop and Office," AM. MACHINIST.

Mechanical draftsman, with shop and drawing-room experience, desires engagement. Excellent references. Address Box 8, AM MACHINIST.

Engineer.—Licensed, sober American of ability and experience desires employment; been running Corliss engine; wages reasonable. Geo. Belding, 20 Varick Place, N. Y.

Superintendent or Salesman—Position wanted by a man of 35; well up in engineering and accustomed to handle mechanical specialties. Would take charge of a stand at New Orleans, having had much experience as an exhibitor. Address F., care AM. MACHINIST.

Wanted—To arrange with some firm to manufacture and sell a patented embroidering machine, on royalty or otherwise. Address Embroidering Machine, AM. MACHINIST.

Wanted—One new planer, 36x36x10 feet; one second-hand planer, 30x30x8 feet. State lowest price and full description. George R. Lombard & Co., Foundry, Machine and Boiler Works, Augusta, Ga.

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42 Inch Swing, 26 feet bed, all complete, in fine condition.
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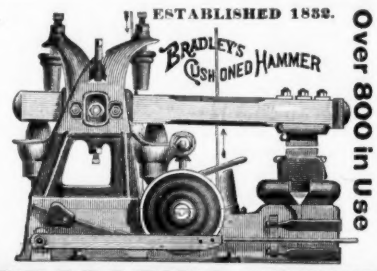

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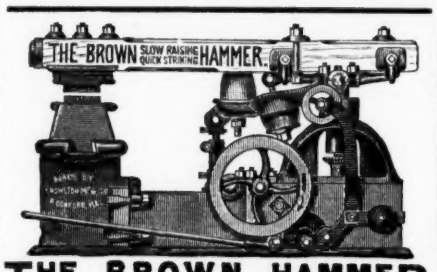

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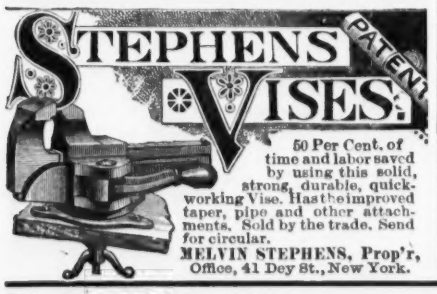
PATENTS! Thomas P. Simpson, Washington, D. C. No pay asked for patent until obtained. Write for inventor's guide.



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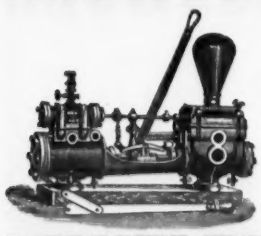

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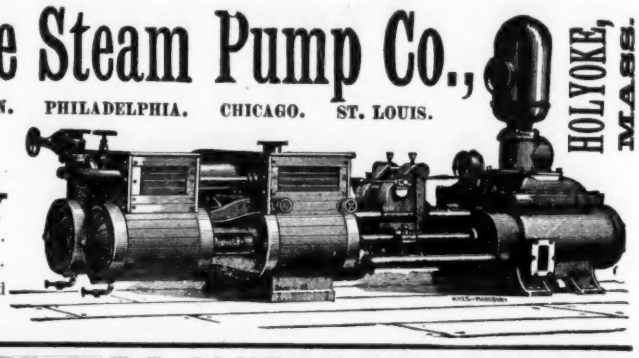

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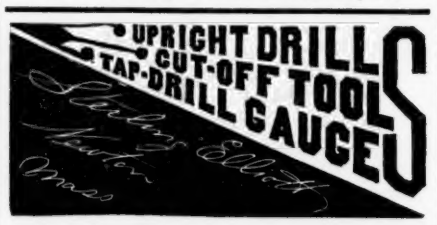

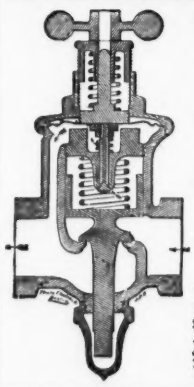
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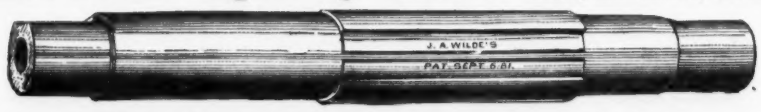

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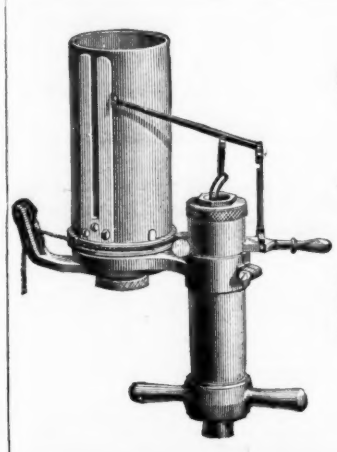

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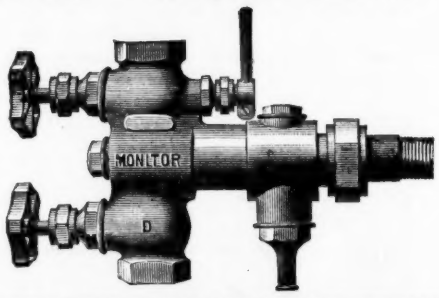

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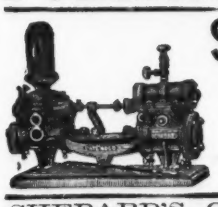

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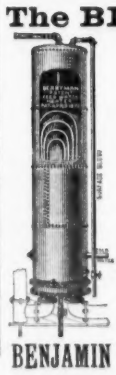

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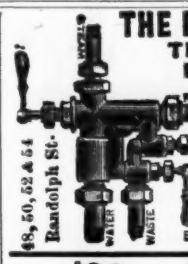

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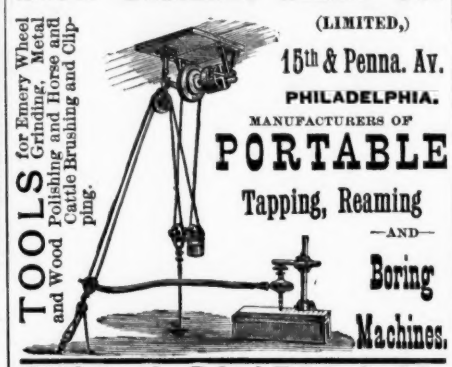

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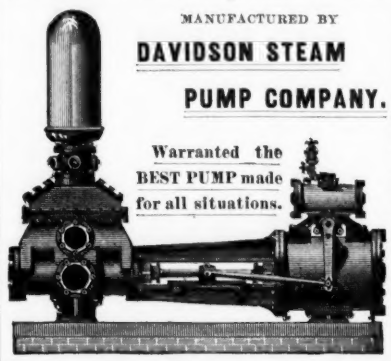

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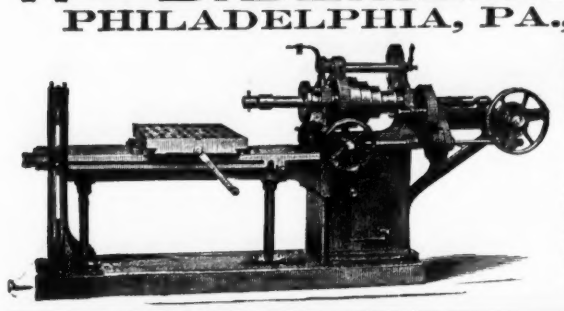

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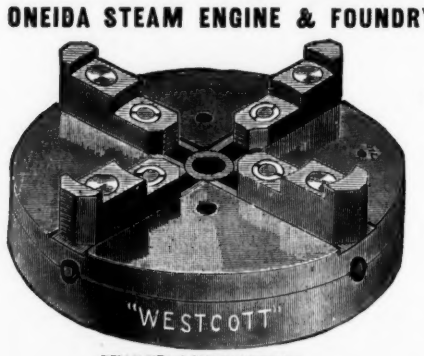

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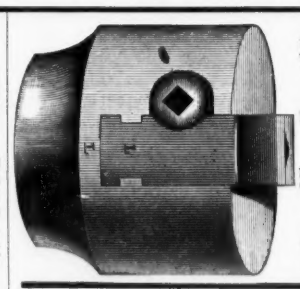

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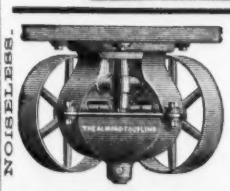

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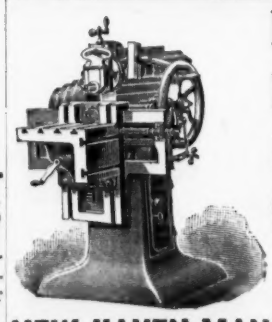

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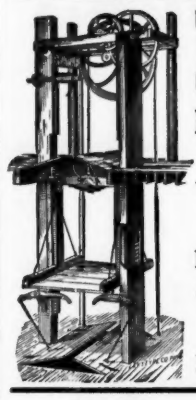

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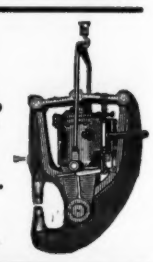

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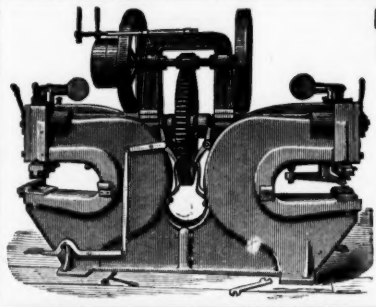

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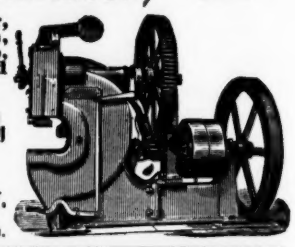

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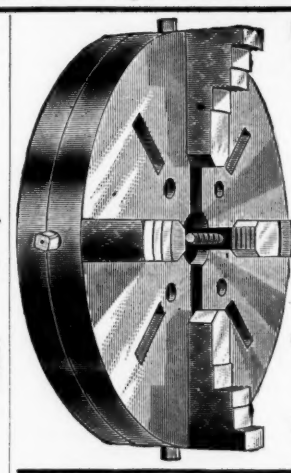

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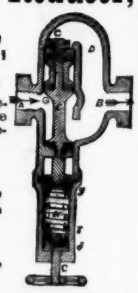

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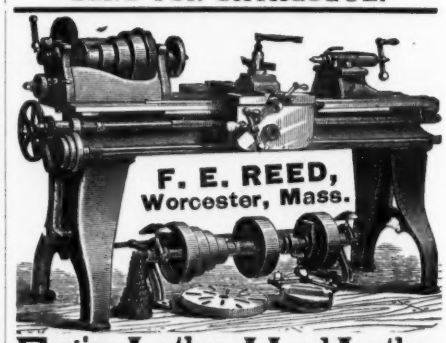

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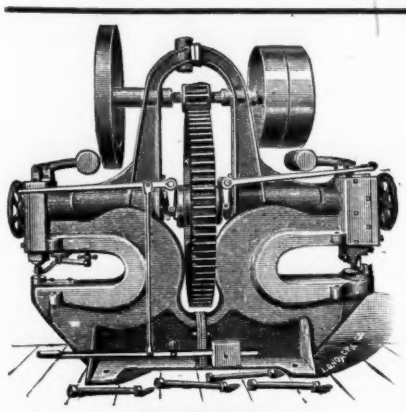

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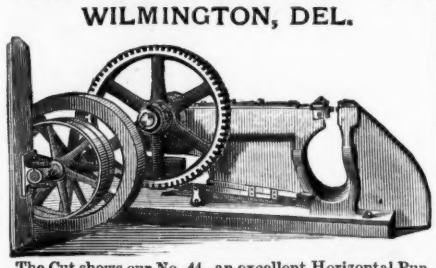

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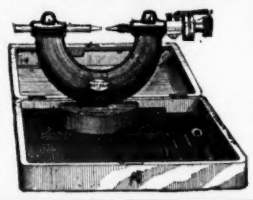

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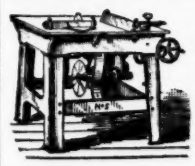

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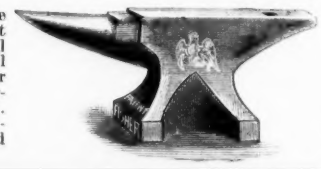

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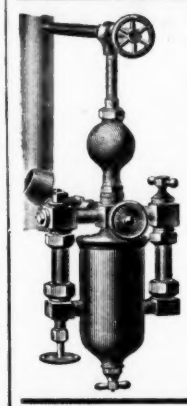

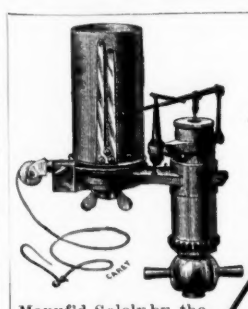

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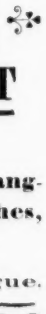

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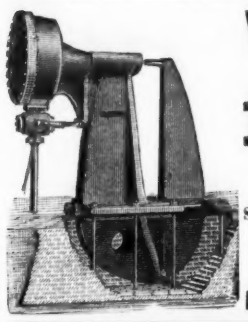

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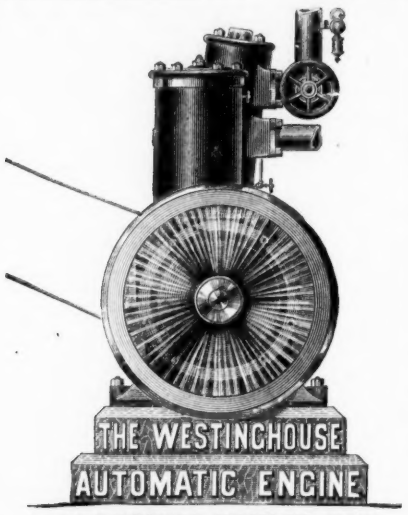

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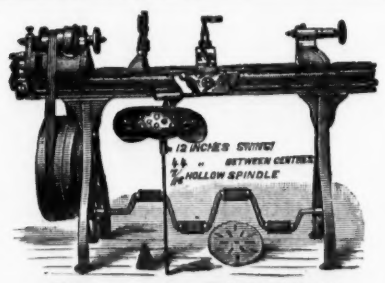

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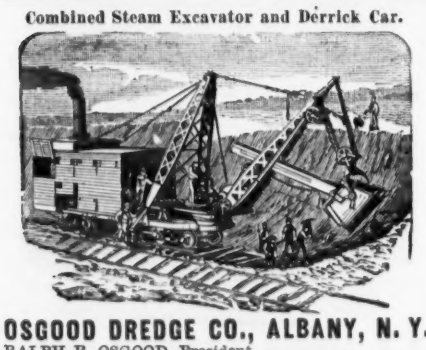

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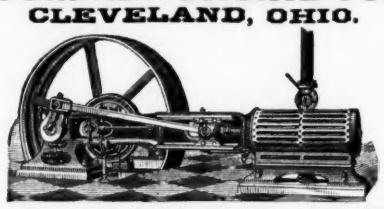

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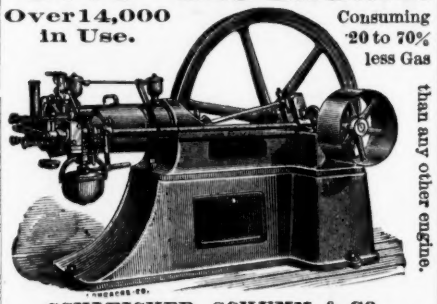

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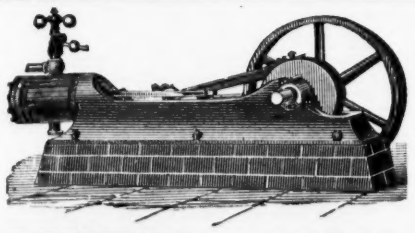

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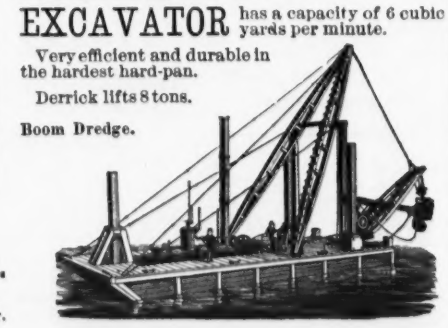

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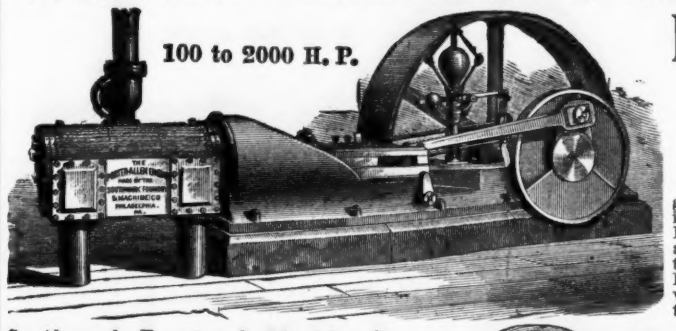

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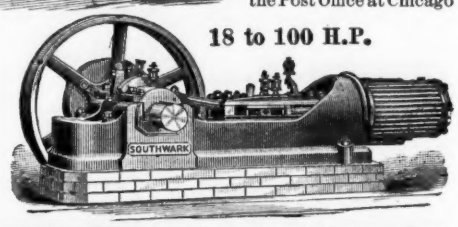

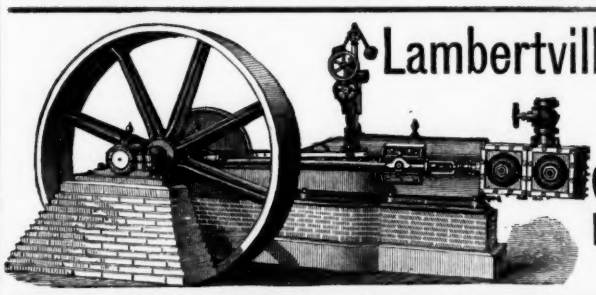

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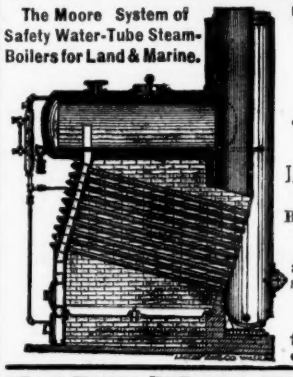

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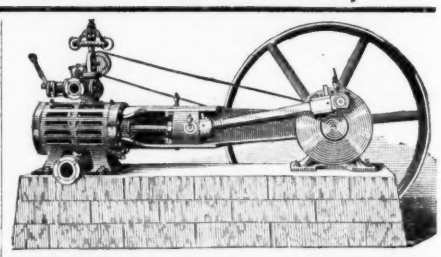

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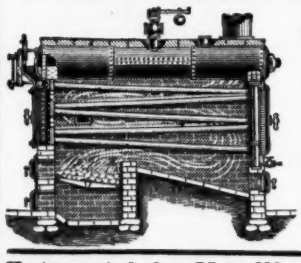

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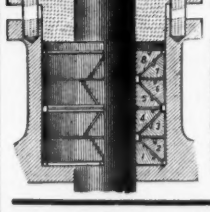

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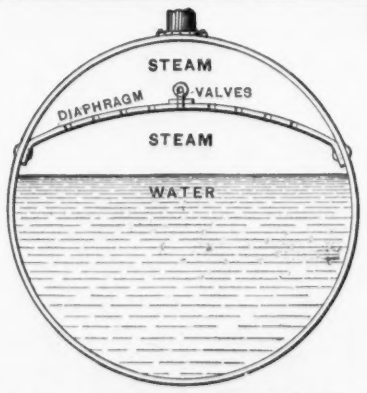

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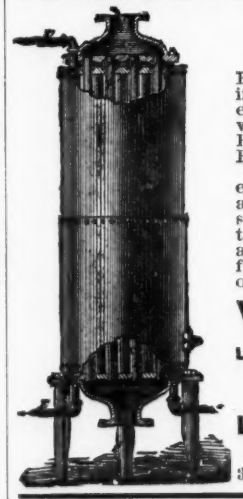

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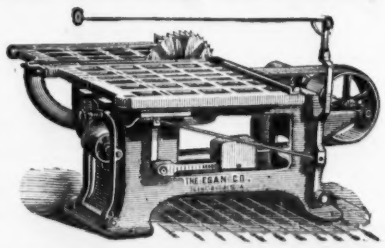

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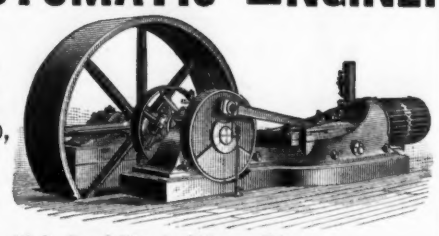

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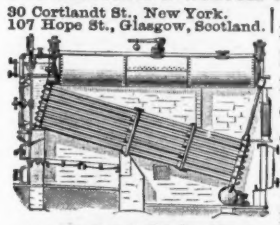

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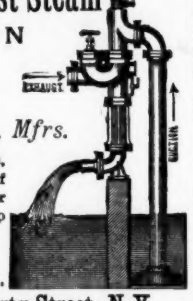

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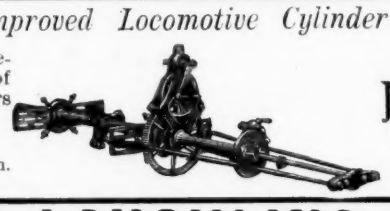

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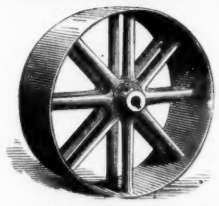

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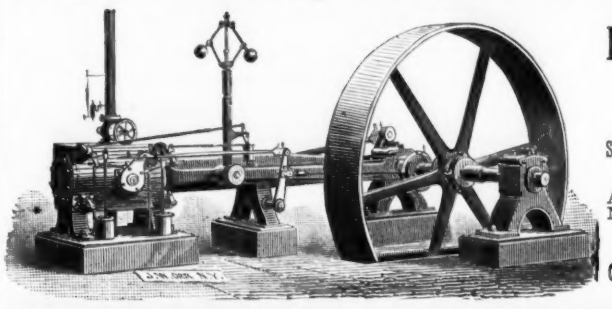

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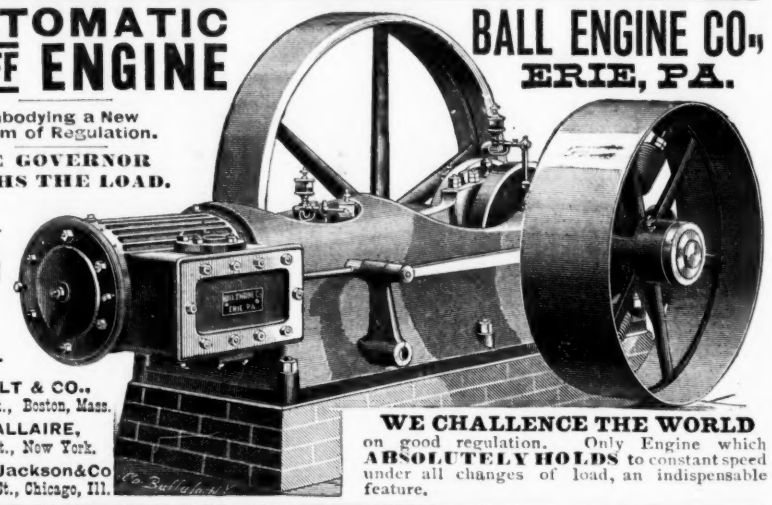

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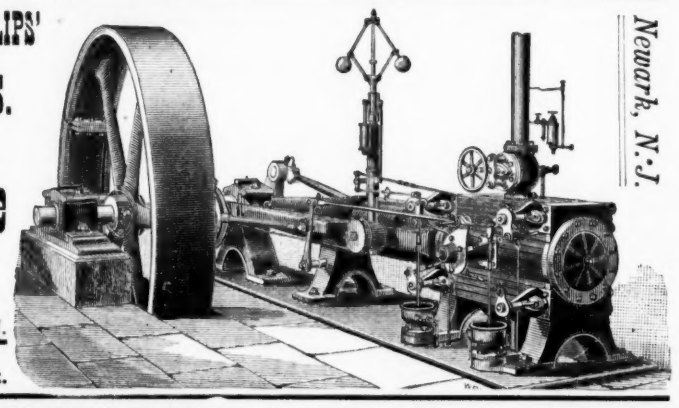

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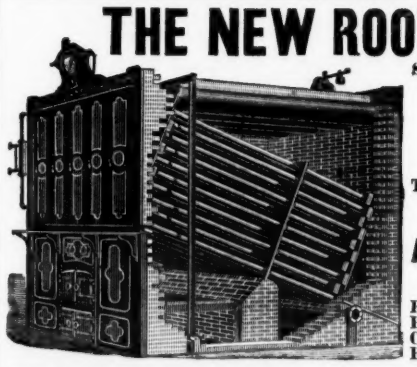

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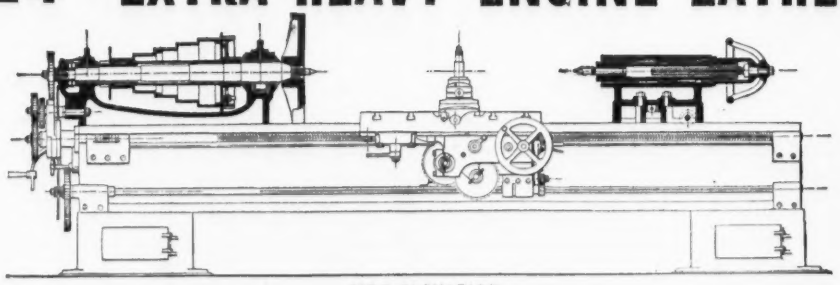

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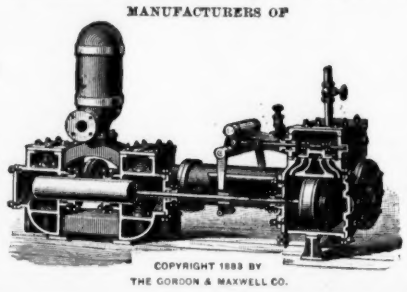

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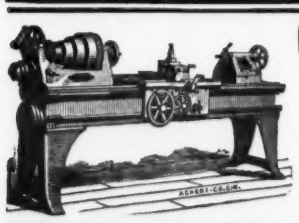

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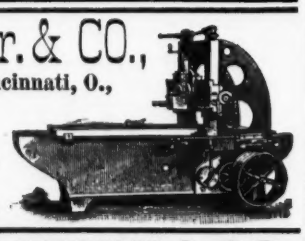

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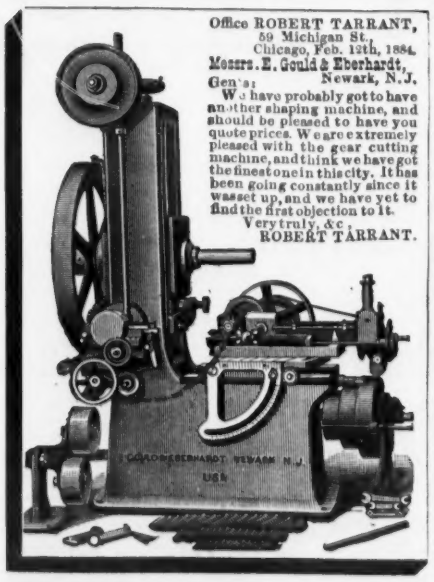

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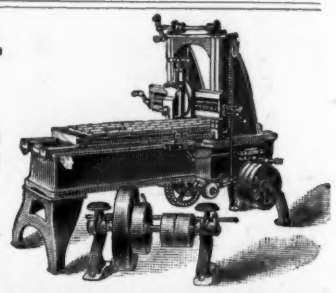

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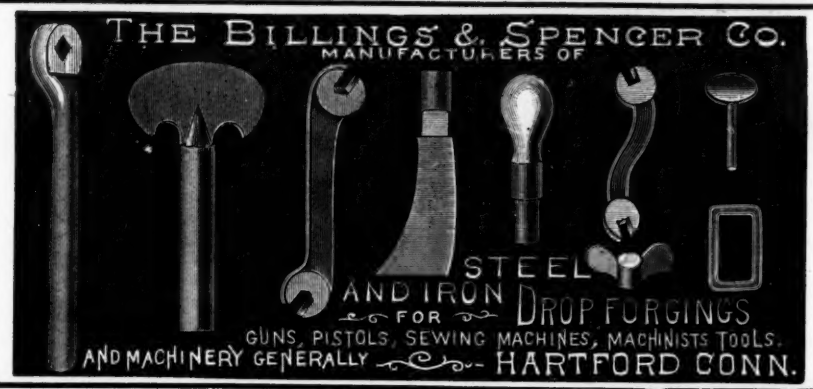

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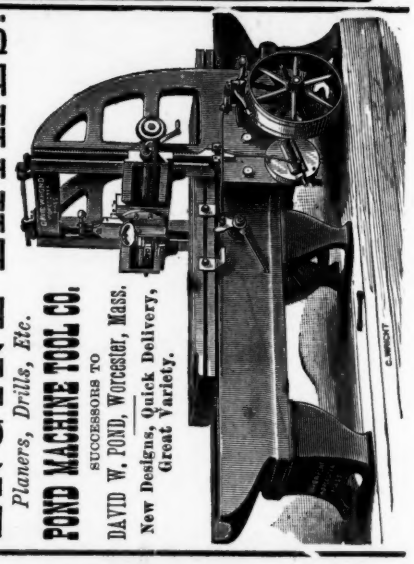

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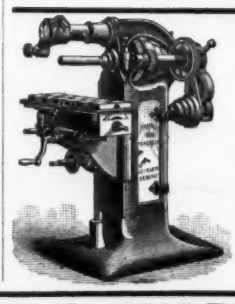

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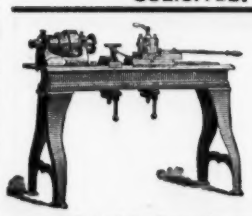

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